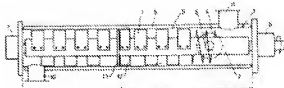


1) Family number: 3883431 (US4420892A)

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Title: Thin film contact dryer

Abstract: Source: US4420892A The thin film contact dryer consists of a rotor having flat rotor elements extending in a radial direction. In the central third of the rotor is arranged at least one combination of distributing elements and an annular weir which revolves with the rotor and leaves a narrow annular gap open to the internal dryer wall, the annular weir being arranged immediately downstream of the distributing elements as viewed in the direction of flow.

**Classifications:****International (IPC 8-9):** B01D1/22 B01D1/24 F26B17/18 F26B17/28 (Advanced/Invention)**International (IPC 1-7):** B01D1/24 F26B11/16 F26B17/20 F26B17/28 F26B3/22**European:** F26B11/16 F26B17/20 F26B3/22**US:** 34/182 34/183 366/149 366/315**Family:**

Publication number	Publication date	Application number	Application date
DE2911549 A1	19800925	DE19792911549	19790323
DE2911549 C2	19811001	DE19792911549	19790323
DE3062161 D1	19830407	DE19803062161	19800313
EP0017040 A1	19801015	EP19800101291	19800313
EP0017040 B1	19830302	EP19800101291	19800313
JP55149603 A2	19801121	JP19800034826	19800321
JP63133301 U1	19880831	JP19860012248U	19880202
US4420892 A	19831220	US19820343791	19820129

Priority:

DE19792911549 19790323 US19800126764 19800303 DE19803062161 19800313

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⑨ BUNDESREPUBLIK
DEUTSCHLAND



DEUTSCHES
PATENTAMT

⑩ Offenlegungsschrift
⑪ DE 38 14 837 A 1

⑫ Aktenzeichen: P 38 14 837.4
⑬ Anmeldetag: 2. 5. 88
⑭ Offenlegungstag: 16. 11. 89

⑮ Int. Cl. 4:
A 23 G 9/28
B 65 D 83/14
B 65 D 85/78
B 65 D 25/52
G 01 F 11/00

DE 38 14 837 A 1

Behördeneigentlich

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⑱ Erfinder:
gleich Anmelder

②4 Vorrichtung zum Dosieren von Softeis

Die Vorrichtung zum Dosieren von Speiseeis besteht aus einem unter Druckgas stehenden Gefäß, welches mit Softeis gefüllt ist.

DE 38 14 837 A 1

Beschreibung

Die Erfindung betrifft eine Vorrichtung zum Dosieren von Softeis.

Es sind sogenannte Portionierungseinrichtungen für Speiseeis bekannt, die im wesentlichen aus einer Halbschale bestehen, die durch einen handbetätigten Mechanismus in ihrem Umfang etwas vergrößert werden kann, so daß aus der gefüllten Schale das Eis leichter entfernt werden kann.

Solche Portionierungsvorrichtungen geben nur eine bestimmte Menge von Speiseeis ab. Eine Variation der abzugebenden Menge ist mit einer solchen Portionierungsvorrichtung nicht möglich.

Darüber hinaus sind Packungen für Speiseeis bekannt, die in den verschiedensten Größen vorgesehen sind, so z.B. gibt es Becher mit Speiseeis, Tüten mit Speiseeis usw.

Mit allen diesen Einrichtungen läßt sich jedoch eine bestimmte Menge nicht dosieren. In manchen Fällen ist es jedoch gewünscht, eine bestimmte dosierte Menge zur Verfügung zu haben, insbesondere im Haushalt, wobei bei der Bedienung der verschiedensten Abnehmer auch die verschiedensten Mengen gewünscht werden.

Mit Hilfe der erfindungsgemäßen Vorrichtung wird die gestellte Aufgabe gelöst. Die Vorrichtung besteht aus einem unter Druckgas stehenden Gefäß, welches mit Softeis gefüllt ist. Die Auslaßöffnung des Gefäßes ist durch eine verstellbare Verschlüßhülse bekannter Bauart verschlossen, so daß bei Betätigung der Verschlüßhülse die Öffnung freigegeben wird und damit die gewünschte Eismenge abgefüllt werden kann.

In der Zeichnung ist eine beispielsweise Ausführungsform dargestellt.

Mit 1 ist das Gefäß bezeichnet, welches teilweise mit Softeis gefüllt ist und darüberhinaus ein Druckgas 3 enthält. Der die Auslaßöffnung 5 verschließende Verschlüßmechanismus ist mit 4 bezeichnet und ist an sich bekannt. Die Verschlüßhülse 2 ist verstellbar, so daß beim Abbiegen der Verschlüßhülse der Verschlüßmechanismus die Öffnung freigibt, wie das auch bekannt ist. Auf diese Weise kann eine dosierte Eismenge abgegeben werden.

Patentansprüche

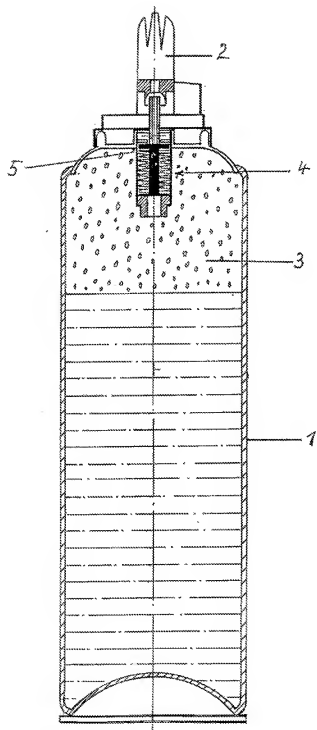
1. Vorrichtung zum Dosieren von Softeis dadurch gekennzeichnet, daß sie aus einem unter Druckgas stehenden Gefäß besteht, welches mit Softeis gefüllt ist.
2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Auslaßöffnung des Gefäßes durch eine verstellbare Verschlüßhülse bekannter Bauart verschlossen ist.

- Leerseite -

3814837

Nummer:
Int. Cl.⁴:
Anmeldetag:
Offenlegungstag:

38 14 837
A 23 G 9/28
2. Mai 1988
18. November 1989





INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification: B67D 5/64, 1/04, B08B 9/08, A23G 9/28	A1	(11) International Publication Number: WO 95/16634 (43) International Publication Date: 22 June 1995 (22.06.95)
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(21) International Application Number: PCT/AU94/00769

(22) International Filing Date: 13 December 1994 (13.12.94)

(30) Priority Data:
PM 2908 13 December 1993 (13.12.93) AU

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(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, JP, KR, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, TJ, TT, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ).

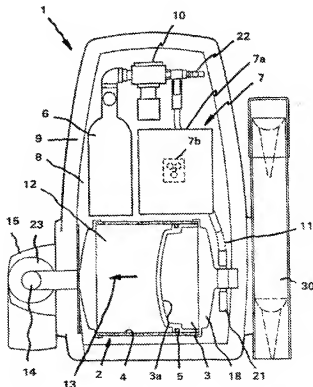
Published

With international search report.

(54) Title: A SELF-CONTAINED PORTABLE FLUID DISPENSING ASSEMBLY

(57) Abstract

A self-contained portable dispensing assembly (1) for dispensing fluid substances, such as foodstuffs, in particular ice-cream, the assembly comprising: a vessel (2) for holding contents to be dispensed, a pressurised container (6) for discharging a propellant, into said vessel, a discharge assembly (15) including a discharge valve through which the contents flow, wherein the propellant energises the contents of the vessel (2) upon actuation of the discharge valve; and wherein the dispensing assembly (1) is contained within a housing (9) capable of mounting on the back of an operator of the dispensing assembly (1). The dispensing assembly (1) includes a piston or diaphragm (3) for energising the contents of the vessel (2) in response to energisation of the piston (3) by the propellant. A cooling assembly (7) and a cone dispenser (30) can be provided. The discharge assembly (15) can be in the form of an arm (23) which forms part of the assembly (1).



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A SELF CONTAINED PORTABLE FLUID DISPENSING ASSEMBLY

This invention relates to a portable dispensing assembly for dispensing fluid substances such as but not limited to foodstuffs such as ice-cream. More particularly, the invention relates to a dispensing assembly able to be worn as a 'back-pack' by an operator so that the contents may be dispensed in remote locations.

The invention may also be used to dispense substances other than foodstuffs such as poisons, water, chemicals and the like. Although the invention is suitable for dispensing substances other than foodstuffs, it will be described principally with reference to its application for dispensing foodstuffs and particularly ice-cream.

Ice-cream is usually dispensed for purchase from an open, externally-cooled container, by the use of a scoop or by extension from a power-operated device, via a faucet or spigot. This form of dispensing means that the ice-cream storage containers must remain in one place as they are too heavy to be portable and cannot be separated from their source of refrigeration.

The present invention aims to overcome the several problems inherent in the above-mentioned systems by providing according to one embodiment a dispensing device for fluid substances and the like which is portable and includes self contained cooling means. Thus, the present invention, in one form, comprises a dispensing assembly including a vessel for the said substance; a floating piston or diaphragm arranged for movement in the vessel; a source of propellant gas for moving the piston or diaphragm within the vessel; a discharge line through which the substance is able to pass and which terminates in a dispensing nozzle in communication with a discharge valve; and a regulator valve for controlling the flow of propellant gas from the source to the rear face of the piston.

In a preferred embodiment of the invention, the above-described dispensing assembly is incorporated into a 'back-pack' able to be carried by an operator so that a paste like substance such as ice-cream or the like may be dispensed and sold at remote locations. Such

a back-pack form may also include cooling means such as a receptacle for ice or 'dry ice' and a cone holder with an associated cone-feed mechanism.

In one broad form the present invention comprises;
a self contained portable dispensing assembly for dispensing fluid substances, the assembly comprising;
a vessel for holding contents to be dispensed,
a pressurised container for discharging a propellant, into said vessel,
a discharge assembly including a discharge valve through which the contents flow, wherein the propellant energises the contents of the vessel, upon actuation of the discharge valve; and
wherein the dispensing assembly is contained within a housing capable of mounting on the back of an operator of the dispensing assembly.

In another broad form the present invention comprises;
a portable fluid dispensing assembly including means for mounting the assembly on the back of an operator; the dispensing assembly comprising;
a vessel for storage of contents to be dispensed wherein the vessel is in communication with both a container for storing and discharging a propellant into said vessel to energise said contents and a discharge assembly through which the contents of the vessel are discharged via a discharge valve.

In its broadest form the present invention comprises;
a portable dispensing assembly for dispensing fluid substances; the dispensing assembly comprising;
a vessel for receiving and holding contents to be dispensed, which vessel is in communication with a propellant and a discharge assembly,
a container for the propellant capable of discharging the propellant under pressure into said vessel to energise said contents, wherein the energised contents are discharged from the assembly via the dispensing valve assembly.

According to a preferred embodiment, the dispensing assembly is contained within a housing forming a back pack which fits to the back of an operator via shoulder saddles and a waist harness.

The present invention will now be described in more detail according to a preferred but non-limiting embodiment and with reference to the accompanying illustrations wherein;

- Figure 1: shows a schematic view of a dispensing assembly according to preferred embodiment of the invention;
- Figure 2: shows a long section through a preferred embodiment of the dispensing assembly incorporated into a back pack housing;
- Figure 3: shows a side elevation of the dispensing assembly of figure 2 (concealed) in a back pack housing according to one embodiment;
- Figure 4: shows a long section through the dispensing assembly showing the interrelationships between the internal components of the machine from a side elevation;
- Figure 5: shows a side view of the back pack housing according to an alternative embodiment of the invention;
- Figure 6: shows a front elevation of the housing of figure 5 showing the arrangements for attachment of the back pack housing to an operator;
- Figures 7a,b,c: show front, side and plan views respectively of a cone holding attachment;
- Figure 8: shows a dispensing assembly incorporated into a back pack mounted on the back of an operator;
- Figures 9a,b: show an underside view and front elevation of a dispensing valve according to a preferred embodiment.

It should be noted that the drawings are by way of example only and that, throughout them, like features are indicated by the same numeral.

Referring to figure 1, there is shown a schematic layout of a dispensing assembly according to a preferred embodiment of the present invention

The dispensing assembly shown comprises a preferably cylindrical vessel 2 for holding contents to be dispensed. Such contents may comprise a paste-like substance such as an ice-cream mix although it will be appreciated that fluid substances other than foodstuffs can be dispensed from the dispensing assembly.

Vessel 2 is, according to the embodiment described, constructed from a food compatible material strong enough to withstand operational pressures and includes a floating piston 3 adapted for movement therewithin. Piston 3 is in sealing engagement with the inner wall 4 of vessel 2 with the sealing effected by means of a sealing ring 5 engaging inner wall 4. Vessel 2 includes a gas bottle 6 containing a propellant gas such as compressed air or carbon dioxide. The propellant gas enters vessel 2 via regulator 10 which controls the flow of gas along feed line 11 to the rear face 3a of piston 3. Preferably regulator 10 is equipped with a filter. Under pressure, piston 3 forces the contents 12 of vessel 2 in the direction of arrow 13 towards discharge line 14. Discharge line 14 terminates in a discharge assembly 15 which includes dispensing valve 16 (see figures 9a and b) responsive to operation of a control handle 17.

Referring now to figure 2 there is shown a long section through a dispensing assembly of the type illustrated in figure 1. Figure 2 shows the assembly 1 disposed within a cavity 8 formed by housing 9. As for the embodiment of figure 1, the assembly shown comprises a gas bottle 6 linked to regulator 10 which operates the flow of propellant to vessel 2 via feed line 11. Propellant gas flowing along feed line 11 to the vessel 2 travels via feed line connector 21 thence into space 20 behind piston 3 so that the propellant gas impinges on surface 3a of the piston 3. Piston 3 includes a sealing ring 5 which ensures separation between the contents 12 of the vessel and the propellant and reduces the possibility of binding of piston 3. Contents 12 exit vessel 2 via discharge line 14 which is contained in dispensing arm 23 and which terminates in discharge assembly 15.

Also included within housing 9 is a cooling assembly 7 which comprises a receptacle 7a, a coolant such as 'dry-ice' contained in the receptacle and a fan 7b. The cooling is effected by air passage over the coolant which preferably comprises dry ice. To achieve this, fan 7b generates an air flow within housing 9. As the air is accelerated over the coolant, it cools, reducing the temperature within cavity 8 of housing 9. This cooled air circulates about vessel 2 thereby cooling the contents.

Ideally, vessel 2 of dispensing assembly 1 is adapted for speedy replenishment of contents. Access to the inside of vessel 2 is gained via lid 18 which is releasably attached to the wall 19 of vessel 2. When the vessel is to be charged with contents, lid 18 is removed after disconnecting feed line 11 from connecting assembly 21. Once lid 18 is removed this exposes piston 3 which can be readily removed from the inside of vessel 2 by simply sliding it along the internal wall 4 of vessel 2. The vessel can be completely removed from the housing, if necessary, to effect replenishment of the contents and/or cleaning. Once vessel 2 is refilled, cylinder 3 is then relocated within the vessel following which lid 18 is replaced. Reconnection of propellant feed line 11 is then made to connecting assembly 21. The propellant is activated after which the dispensing assembly is again ready for operation. Propellant bottle 6 includes a food approved propellant such as carbon dioxide and may be recharged once the propellant drops below a predetermined operational pressure. The propellant pressure in bottle 6 can be monitored by means of pressure gauge 10. When cylinder 6 is to be recharged any excess propellant can be released from the system via blow off pressure relief valve 22. Cylinder 6 can then be removed by uncoupling at junction 6a.

Figure 3 shows a side elevation of the dispensing assembly 1 indicating the relationship between housing 9 and valve assembly support arm 23

Figure 4 shows a side long sectional elevation through the dispensing assembly of figure 2. As can be seen from figure 4, the vessel 2 is cylindrical with discharge line 14 connected at a point coincident with the central longitudinal axis of the vessel 2 along which line flows

contents 12. Discharge line 14 travels within and along dispensing arm 23 terminating in discharge assembly 15 (see figure 2).

Figure 5 shows a side elevational view of the dispensing assembly concealed in housing 9 and includes shoulder saddles 24 and 25. These saddles enable housing 9 to be conveniently shoulder mounted on the operator and are preferably integrally formed with the housing.

Figure 6 shows a front elevation of the back pack dispenser of figure 5 showing both of the shoulder saddles 24 and 25. The back pack is further secured in position by means of a waist belt 26. Housing 9 and shoulder saddles 24, 25 may be constructed of a plastics material such as urethane or other suitable lightweight material. The discharge assembly 15 preferably comprises a handle 35 of the joy-stick type, as shown in figure 6. Arm-like portion 27 is similar to arm 23 and may contain an ice cream cone supply receptacle 28. Suitable covers may be provided for the cone feed and nozzle ends of arms 23 and 27 respectively. According to an alternative embodiment, a flavour dispensing unit 29 may be incorporated with the discharge assembly.

Referring to figures 7a, b and c there is shown front, side and cross sectional views of an ice cream cone dispenser 30 which is attached to the housing 9 of the dispenser 1 in the manner shown in figure 2. When the dispenser is used for dispensing ice cream, the cone holder is attached to the housing thereby providing a ready supply of cones. According to the embodiment of figure 7a, the cone holder 30 comprises channels 31, 32 and 33 in which cones 34 are placed. Figure 7b shows a side view of the cone holder 30 showing the positioning of cone 34 in channel 31. Figure 7c shows a cross sectional view of the cone holder 30 showing channels 31, 32 and 33 containing cones 34. This is an optional attachment when ice cream is dispensed from the dispenser and can be removed when the dispenser is used for dispensing other substances.

Figure 8 shows an embodiment of the dispensing assembly 1 mounted on the back of a user via shoulder saddles 24 and 25. The user can be seen manipulating joy stick handle 35 which

operates the discharge assembly 15. According to the embodiment shown, arm 27 includes cone supply receptacles 28. Waist belt 26 secures the dispensing assembly to the user as shown.

Referring to figures 9a and b there is shown a dispensing valve 16 which may be incorporated into the discharge assembly 15. Figures 9a and b show an underside and front elevation of the valve respectively. The valve comprising a valve body 40 including a through passage 41 which communicates between an outlet 42 and discharge line 14 (see figures 1 or 2). Valve 16 also comprises a manually operable handle 43 which moves between an open and closed position. The handle moves through an arc of approximately 160°.

In the open configuration the contents of the vessel 2 are able to flow out of the valve body 40 via outlet 42. When in the closed configuration outlet 42 is blocked to prevent discharge of contents 12 and this is effected by rotation of the handle 43 through about 160°.

It is envisaged that the present invention in its basic form as shown in figure 1 will have application in mobile facilities such as motor vans, ice-cream carts, trailers and the like as well as use on stalls, in shops, etc. and is likely to be less expensive than are existing installations.

It is foreseen that the invention may well be offered for hire for parties and similar functions. The back pack embodiment is useful for vending dispensing products such as ice cream at sporting events, street parades, beaches, theme parks etc. In an alternative embodiment the contents of vessel 2 may be discharged by means of a dispensing gun connected to discharge line 14 and retained in a holster worn by the operator.

In a further embodiment the discharge assembly comprises a hand compatible control having a press button which actuates discharge of contents. The control is attached to feed line 14 by means of a flexible hose which allows the control to be freely moved within a limited range of movement. Ideally, the button is actuated by the thumb of an operator and the

control is grippingly engaged between the thumb and fingers via ergonomically optimal contours on the control.

It will be recognised by persons skilled in the art that numerous variations and modifications can be made to the invention as broadly described herein without departing from the overall spirit and scope of the invention.

CLAIMS:

1. A self contained portable dispensing assembly for dispensing fluid substances; the dispensing assembly comprising,
a vessel for receiving and holding contents to be dispensed, which vessel is in communication with a propellant and a discharge assembly,
a container for the propellant capable of discharging the propellant under pressure into said vessel to energise said contents, wherein the energised contents are discharged from the assembly via the discharge assembly upon actuation of control means.
2. A self contained portable dispensing assembly for dispensing fluid substances, the assembly comprising;
a vessel for holding contents to be dispensed,
a pressurised container for discharging a propellant, into said vessel,
a discharge assembly including a discharge valve through which the contents flow, wherein the propellant energises the contents of the vessel, upon actuation of the discharge valve; and wherein the dispensing assembly is contained within a housing capable of mounting on the back of an operator of the dispensing assembly.
3. A dispensing assembly according to claims 1 or 2 wherein the contents are discharged from the discharge assembly via a valve in the discharge assembly upon actuation of the control means.
4. A dispensing assembly according to claim 3 wherein the vessel includes therein a piston or diaphragm which energises the contents responsive to energisation of the piston by the propellant; wherein the level of energisation of the contents is regulated by a regulator valve.
5. A dispensing assembly according to claim 4 wherein the communication between the vessel and the discharge assembly is effected by means of a discharge line which is located in an arm which forms part of the housing, along which discharge line passes the contents of the container prior to exiting via said discharge assembly.

6. A dispensing assembly according to claim 5 wherein the propellant container comprises a gas bottle connected to a feed line which line communicates with the vessel via a pressure regulator and temperature sensor.

7. A dispensing assembly according to claim 6 further comprising a cooling assembly including a receptacle for receiving and retaining a coolant and means for circulating cooled air at least around the vessel

8. A dispensing assembly according to claim 7 wherein the means for circulating cooled air comprises a fan for generating air flow over the coolant and a thermostat controlling the fan.

9. A dispensing assembly according to claim 8 wherein the cooling means drives air around the internal space of the housing such that cooled air envelops the vessel thereby cooling its contents.

10. A dispensing assembly according to claim 9 wherein at least the vessel, cooling means and propellant container are located inside a housing said housing enabling transportation of the dispensing assembly on the back of an operator.

11. A dispensing assembly according to claim 10 wherein the discharge assembly valve is responsive to actuation of a control handle which provides said control means.

12. A dispensing assembly according to claim 11 wherein the housing is manufactured in a mould from urethane or other lightweight material.

13. A dispensing assembly according to claim 12 wherein, when the contents comprise a foodstuff at least the internal materials which contact the contents are food compatible.

14. A dispensing assembly according to claim 13 wherein the coolant is dry ice.

15. A dispensing assembly according to claim 14 wherein the cooling means is adjacent the vessel.

16. A dispensing assembly according to claim 14 wherein the contents comprise a paste-like substance such as ice cream.

17. A dispensing assembly according to claim 16 wherein the housing has integral therewith shoulder saddles and a waist belt for mounting on the back of an operator

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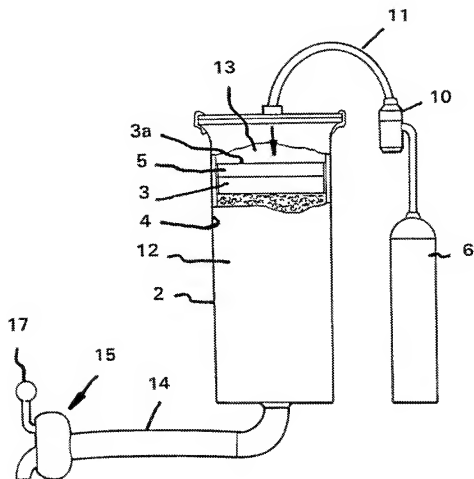


FIGURE 1

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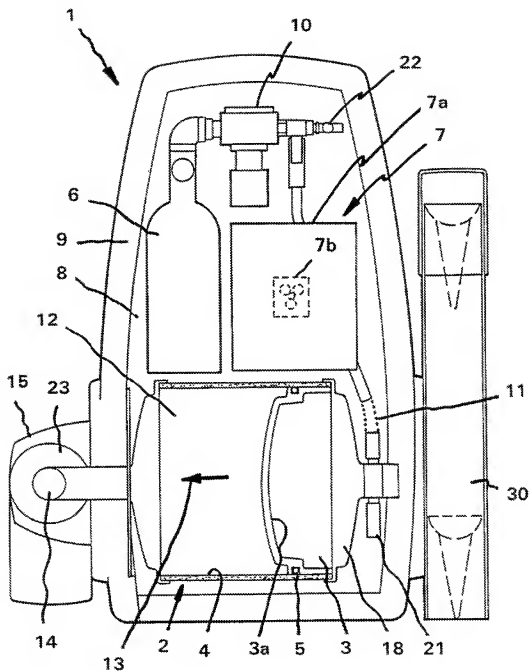


FIGURE 2

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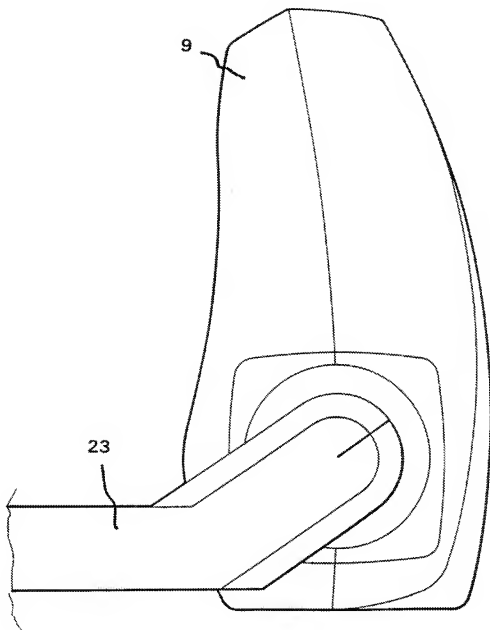


FIGURE 3

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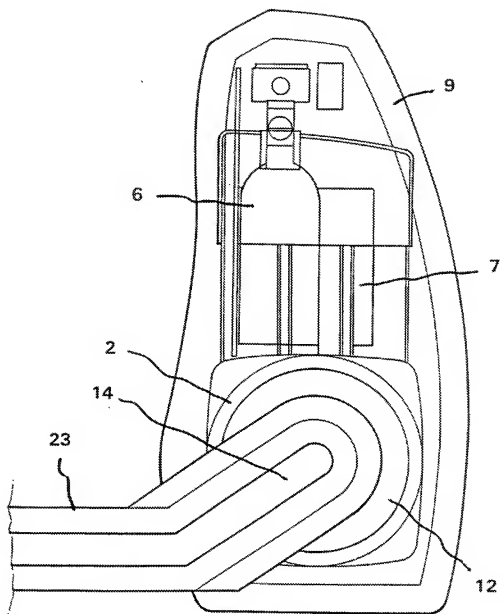


FIGURE 4

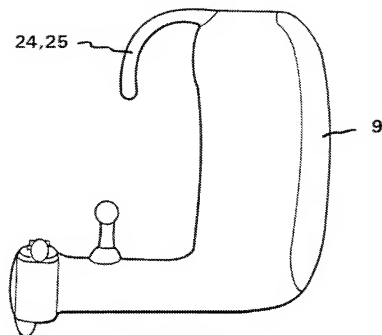


FIGURE 5

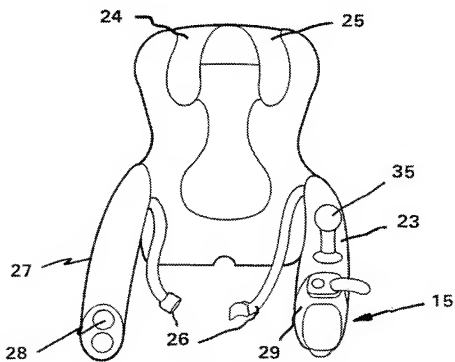


FIGURE 6

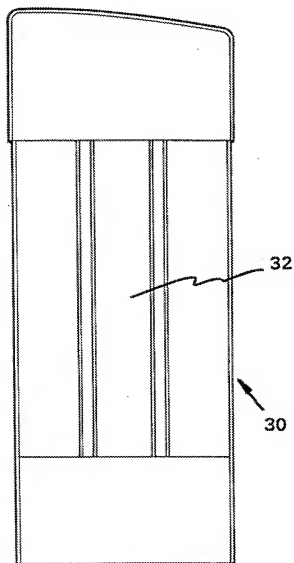
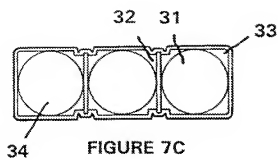


FIGURE 7A

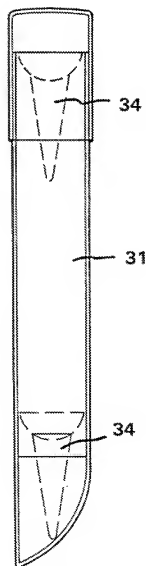


FIGURE 7B

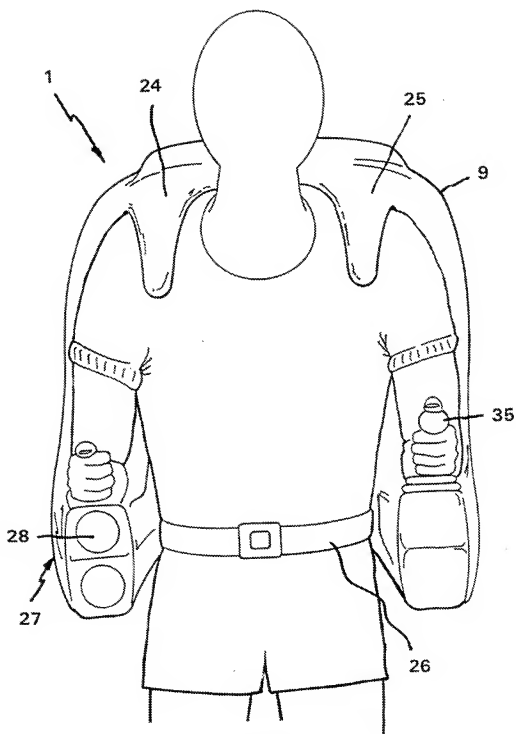


FIGURE 8

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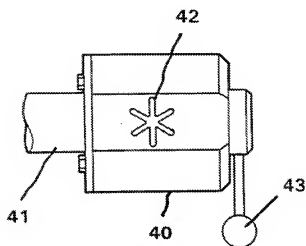


FIGURE 9A

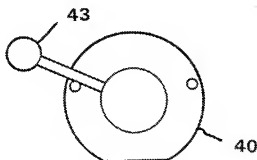



FIGURE 9B

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU 94/00769

A. CLASSIFICATION OF SUBJECT MATTER Int. Cl. ⁶ B67D 5/64, 1/04; B08B 9/08; A23G 9/28 According to International Patent Classification (IPC) or to both national classification and IPC				
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC: B67D 5/64; B08B 9/08, B65D 83/76, A23G 9/28, B67D 1/04 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU:IPC as above; A45F 3/04, 3/08 Electronic data base consulted during the international search (name of data base, and where practicable, search terms used)				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.		
X Y	AU,B, 8073/52 (152979) (DUNSTAN) 29 January 1953 (29.01.53) whole specification	1-3 5		
X Y	AU,B, 27122/54 (212578) (CROWHURST) 28 April 1955 (28.04.55) whole specification; page 3, lines 36-40	1-3 5		
X	GB,A, 2244221 (NOMEK LIMITED) 27 November 1991 (27.11.91) whole specification	1-3		
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.				
* Special categories of cited documents : <table border="0"> <tr> <td style="vertical-align: top;"> "A" document defining the general state of the art which is not considered to be of particular relevance earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed </td> <td style="vertical-align: top;"> "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle of theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "A" document member of the same patent family </td> </tr> </table>			"A" document defining the general state of the art which is not considered to be of particular relevance earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle of theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "A" document member of the same patent family
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Date of the actual completion of the international search 23 February 1995 (23.02.95).		Date of mailing of the international search report 2 Mar 1995 (02.03.95)		
Name and mailing address of the ISA/AU AUSTRALIAN INDUSTRIAL PROPERTY ORGANISATION PO BOX 200 WODEN ACT 2606 AUSTRALIA Facsimile No. 06 2853929		Authorized officer  G.M. COX Telephone No. (06) 2832484		

INTERNATIONAL SEARCH REPORT

International application No.

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate of the relevant passages	Relevant to Claim No.
X Y	US,A, 3286884 (LONG) 22 November 1966 (22.11.66) whole specification	1-3 5
X	US,A, 2732977 (CHARPIAT) 31 January 1956 (31.01.56) whole specification	1-3
X Y	US,A, 5199609 (ASH) 6 April 1993 (06.04.93) whole specification	1-3 5
X	AU,A, 51897/90 (PLEET) 7 September 1990 (07.09.90) whole specification	1, 3
X	US,A, 2917906 (WOLLEY) 22 December 1959 (22.12.59) whole specification	1, 3
X	AU,A, 58702/86 (GEORGE) 18 December 1986 (18.12.86) whole specification	1, 3
X Y	EP,A, 366444 (THIRST AID INC) 2 May 1990 (02.05.90) whole specification	1-3 5
A	AU,B, 31247/49 (146302) (HARRISON) 26 January 1950 (26.01.50) whole specification	
X	US,A, 4869402 (ASH) 26 September 1989 (26.09.89) whole specification	1-3
Y	EP,A, 314209 (BRAVO S.p.A) 3 May 1989 (03.05.89) whole specification	4
Y	EP,A, 285709 (BRAVO S.p.A) 12 October 1988 (12.10.88) whole specification	4
Y	AU,A, 59635/90 (McGILL) 7 February 1991 (07.02.91) whole specification	4
X	AU,A, 20827/76 (APAW) 22 December 1976 (22.12.76) whole specification	1, 3
X	US,A, 4651903 (24 March 1987) (24.03.87) whole specification	1-3
Y	AU,A, 30357/84 (IMPERIAL CHEMICAL INDUSTRIES PLC) 17 January 1985 (17.01.85) whole specification	5

INTERNATIONAL SEARCH REPORT

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report				Patent Family Member			
GB	2244221						
US	5199609						
AU	51897/90	US	4921135	WO	9009951		
AU	58702/86						
EP	366444	CA	2001517	US	4921143		
EP	314209						
EP	285709						
AU	59635/90	CA UK WO	2021334 95129 9101090	CN PT ZA	1048826 94777 9005697	GR US	90100553 5150820
US	4651903	CA	1275076				
AU	30357/84	GB	2143153				



DEMANDE INTERNATIONALE PUBLIÉE EN VERTU DU TRAITE DE COOPÉRATION EN MATIÈRE DE BREVETS (PCT)

(51) Classification internationale des brevets ⁶ : A23G 9/02, 9/04	A1	(11) Numéro de publication internationale: WO 97/30600 (43) Date de publication internationale: 28 août 1997 (28.08.97)
<p>(21) Numéro de la demande internationale: PCT/FR97/00338</p> <p>(22) Date de dépôt international: 26 février 1997 (26.02.97)</p> <p>(30) Données relatives à la priorité: 96/02527 26 février 1996 (26.02.96) FR</p> <p>(71) Déposant (pour tous les Etats désignés sauf US): SOCIÉTÉ CIVILE R.S.A. [FR/FR]; Immeuble Théogone, 10, avenue de l'Europe, F-31520 Ramonville-Saint-Agne (FR).</p> <p>(72) Inventeurs; et (75) Inventeurs/Déposants (US seulement): RIVIERE, Philippe [FR/FR]; 65, rue Ernest-Feydoua, F-31400 Toulouse (FR). SILVENTE, Stéphane [FR/FR]; 17, rue Maury, F-31000 Toulouse (FR). TONON, Frank [FR/FR]; 46, domaine des Pêcheurs, F-27930 Normandville (FR). ANDRE-LINET, Véronique [FR/FR]; Appartement 170, Le Clos Vicaire, 12, rue du Carmel, F-27930 Gragny (FR).</p> <p>(74) Mandataire: RAVINA, Bernard; 24, boulevard Riquet, F-31000 Toulouse (FR).</p>	<p>(81) Etats désignés: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, brevet aripi (GH, KE, LS, MW, SD, SZ, UG), brevet eurasien (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), brevet européen (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), brevet OAPI (BF, BI, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Publiée Avec rapport de recherche internationale.</p>	
(54) Titre: FROZEN DESSERT		
(54) Titre: DESSERT GLACE		
(57) Abstract		
<p>A frozen dessert spoonable at the freezing temperature and/or packageable in pressurised containers is disclosed. Said frozen dessert includes dairy proteins, fats, sweeteners, one or more stabilising agents and flavouring or colouring agents. Said proteins are provided by dairy milk substitutes and/or skimmed milk, the fat is a vegetable oil with a very low freezing point, and the sweeteners are a mixture of low molecular weight sweetening agents, e.g. dextrose and/or fructose, invert sugar and glucose syrup.</p>		
(57) Abrégé		
<p>La présente invention concerne un dessert glacé susceptible d'être cuillérable à température de congélation et/ou d'être conditionné dans des récipients sous pression. Le dessert glacé selon l'invention dont la composition comprend des protéines d'origine laitière, des matières grasses, des matières sucrantes, un ou des agents stabilisants et des agents aromatisants ou colorants se distingue notamment en ce que: les protéines sont apportées par des produits lacto-remplaceurs d'origine laitière et/ou du lait écrémé, la matière grasse est une huile végétale à très bas point de congélation; les matières sucrantes sont un mélange d'agents sucrants de faible poids moléculaire tels que: dextrose et/ou fructose, sucre inverti, sirop de glucose.</p>		

UNIQUEMENT A TITRE D'INFORMATION

Codes utilisés pour identifier les Etats parties au PCT, sur les pages de couverture des brochures publiées des demandes internationales en vertu du PCT.

AT	Arménie	GB	Royaume-Uni	MW	Malawi
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GA	Gabon			VN	Viet Nam

DESSERT GLACE.

La présente invention concerne un dessert glacé.

Le dessert glacé selon l'invention est du type comprenant essentiellement des protéines d'origine laitière, des
5 matières grasses, des agents sucrants et un ou des agents stabilisants.

Le dessert glacé selon l'invention pourra, selon les besoins, contenir des agents aromatisants, des agents colorants ou des inclusions comestibles, où entre lui-même
10 inclu dans des pâtisseries par exemple avec un enrobage de pâte.

Ces produits sont habituellement obtenus par congélation des composants ci-dessus énoncés et leur conservation jusqu'à consommation suppose le maintien avec
15 froid négatif, la température de congélation pouvant aller jusqu'à moins 18° et même moins 24° centigrades.

De ce fait, les produits obtenus sauf à subir une période de réchauffement, présentent une consistance particulièrement dure qui empêche leur consommation
20 immédiate et rend leur division à la cuillère impossible ou du moins difficile.

Dans le cas de portion importante, lorsque la portion n'a pas été entièrement consommée, sa conservation après réchauffement pour division, suppose une recongélation
25 qui a des incidences sur la structure du produit avec réalisation de gros cristaux donnant en bouche un goût acqueux et une texture plus dure et présente des risques bactériologiques.

De plus, ces produits après décongélation jusqu'à
30 température de consommation perdent une partie de leurs propriétés de stabilité et de leurs qualités gustatives. L'art antérieur a proposé des solutions :

Le brevet GB 1563191 se propose de réaliser une crème glacée qui est cuillérable à température de
35 congélation et dont la composition contient à la fois des agents stabilisants et des produits du type glycérol qui abaissent le point de congélation.

Le brevet GB 2019187 décrit une préparation analogue au brevet précédent dans lequel outre les

stabilisants et les produits du type glycérol. les agents sucrants utilisés sont des agents sucrants à faible poids moléculaire du type sucrose, glucose, fructose, sucre inverti qui entrent dans la composition pour leur capacité à abaisser son point de congélation.

Le brevet US A 4 400 406 (MORLEY 8 83) concerne un dessert glacé qui peut être extrudé ; cependant, dans la partie concernant l'extrusion de la glace, il n'y a pas de référence à la température qui est vraisemblablement de l'ordre de -5 à 6°C. Il n'est pas fait mention d'extrusion à -20°C.

Selon l'exemple six, il est fait usage d'huile de noix de coco, dont le point de fusion est élevé, à un taux de 11%.

Dans ces conditions, l'huile de noix de coco donne un produit dur non cuillérable.

Dans la composition du brevet MORLEY US 4 400 406, les auteurs utilisent un mélange de fructose, sorbitol et sirop de maïs (remplaçable par de l'hydrolysât d'amidon ou sucre inverti). Le choix de sirop de maïs est classique. La présence de sorbitol est justifiée par un besoin de compenser le peu de fructose, qui autrement donne trop de goût sucré au produit.

En ce qui concerne le choix de stabilisant, le brevet US 4 400 406 mentionne la liste quasi exhaustive de tous les produits du domaine connu. Le produit selon ce brevet se caractérise par un choix de pourcentage particulier de stabilisant et par une combinaison expresse de trois agents stabilisants différents, dont la gélatine ou un équivalent.

Le brevet US A 4 421 778 (KAHN 12/83) concerne un produit de type "milk-shake" qui est foisonné pour être ensuite conservé à température de congélation et cuillérable ou extrudable à cette température.

Ce brevet US concerne un produit fouetté, contenant donc une proportion importante d'air : mention est faite du temps de conservation de six mois sans perte importante de volume correspondant au dégonflement du produit et à son tassement.

En ce qui concerne les matières grasses, KAHN cite l'utilisation d'une matière grasse spécifique évitant la

formation de faces cristallines et donc la cristallisation des matières grasses.

Le brevet US A 4 853 243 (KAHN 8/89) concerne un produit fouetté dont l'originalité réside dans la limitation de cristallisation. La philosophie est d'utiliser un pré-mix que l'on traite par la suite, après décongélation et fouettage. Il s'agit encore d'un produit proche du précédent et la cuillérabilité à température de congélation résulte de son contenu d'air élevé. On note que l'auteur n'accorde pas d'importance au point de fusion des matières grasses employées, ni au choix des sucres du mélange sucrant.

Le brevet GB A 1 563 191 (UNILEVER 3/80) décrit un abaissement du point de congélation par utilisation d'un mélange d'agents stabilisants et de polyols (glycérol ou sorbitol).

Il est apparu que fréquemment les stabilisateurs doivent être utilisés dans de telles proportions que la perception en bouche et le goût du produit obtenu peuvent être altérés de même que son aspect qui peut devenir gommeux avec un goût de gras.

De même, l'utilisation d'agents sucrants à faible poids moléculaire peut affecter le goût du produit si la composition des agents sucrants n'est pas étroitement maîtrisée.

Les polyols ou glycérols utilisés pour abaisser le point de congélation présentent en outre l'inconvénient de n'être pas digestibles par l'homme et d'avoir des effets laxatifs.

La présente invention vise à obvier à ces inconvénients tout en permettant la réalisation d'un dessert glacé cuillérable à température de congélation et susceptible d'être conditionné en récipient sous pression. Ce résultat est obtenu par une sélection de la matière grasse d'origine végétale à très bas point de fusion et par la sélection d'un mélange de matières sucrantes spécifiques à faible poids moléculaire et par mélange avec des protéines d'origine laitières.

A cet effet, le dessert glacé selon l'invention dont la composition comprend des protéines d'origine

laitière, des matières grasses, des matières sucrantes et un ou des agents stabilisants se caractérise essentiellement en ce que :

- 5 - les protéines sont apportées par des produits lacto-remplaceurs d'origine laitière et/ou du lait écrémé comprenant 20% à 40% de protéines par rapport au produit brut ;
- la matière grasse utilisée est une huile d'origine végétale à bas point de fusion ;
- 10 - les matières sucrantes sont un mélange d'agents sucrants à faible poids moléculaire, ledit mélange comprenant dextrose et/ou fructose, sucre inverti et sirop de glucose.

Suivant une autre caractéristique de l'invention, le mélange de matières sucrantes comprend :

- 15 - dextrose et/ou fructose,
- sucre inverti,
- sirop de glucose,
- et dans lequel,
- le sucre inverti a un pourcentage d'inversion égal élevé
- 20 par exemple égal à 93 plus ou moins 3 ;
- le sirop de glucose a un dextrose équivalent de l'ordre de 40% par exemple compris entre 35 et 70%.

D'autres avantages et caractéristiques de l'invention apparaîtront à la lecture de la description ci-après de l'invention et de son procédé de mise en oeuvre.

25 Le dessert glacé selon l'invention est du type réalisé par un mélange de protéines d'origine laitière, de matières grasses et de matières sucrantes. Ce mélange est destiné à être congelé après réalisation et à être distribué en état de congélation au consommateur, soit en portion individuelle, soit en ration à diviser en portion, soit en emballage sous pression.

La ration en portion peut être conditionnée dans un emballage unitaire tel qu'un petit pot.

35 Tout autre type d'emploi peut être mis en oeuvre tel que le fourrage d'un gâteau surgelé à découper ou autre. Le produit selon l'invention peut également être distribué sous forme liquide traitée UHT et être soumis à congélation par l'utilisateur.

La difficulté à solutionner est :

- premièrement de réaliser un produit qui dans la plage de température de moins 18° centigrades à moins 24° centigrades, soit à la fois suffisamment souple pour être
5 quillérable sans qu'il soit nécessaire que le produit soit foisonné par incorporation de gaz, ou passer sous pression au travers d'une buse d'un récipient dans lequel le produit est conditionné en pression ;
- deuxièmement, de réaliser un produit stable physiquement
10 pendant le temps de consommation tout en présentant les qualités organoleptiques d'une glace.

L'idée de départ a été de jouer sur les trois composants fondamentaux, sucres, matières grasses et protéines, sur leurs pourcentages relatifs et sur la nature
15 des dits composants et/ou des ingrédients de chacun d'eux afin d'abaisser le point de congélation du mélange.

Il est apparu que les ingrédients protéiques ont une influence essentiellement sur la stabilité et la texture de la glace, notamment en sortie de buse lorsqu'elle est
20 conditionnée en récipient sous pression.

Il est apparu que la nature des ingrédients protéiques, lait écrémé ou lactoreplaceurs, le taux d'incorporation et la composition des ingrédients protéiques ont une influence sur la texture de la glace à température de congélation.

25 Il est apparu au cours des essais que le taux d'ingrédients protéiques devait être compris entre 6% et 18%.

En-dessous de 6%, la texture du produit est bien fluide mais celui-ci manque de tenue et de stabilité.

30 Au-dessus de 18%, le produit est trop ferme.

Dans la fourchette de 6% à 18%, le produit reste malléable en étant plus ferme si on augmente le taux de protéines.

Les produits protéiques peuvent être constitués de lactoreplaceurs seuls ou d'un mélange de lactoreplaceurs
35 et de lait écrémé en poudre ou de ce dernier ingrédient seul.

Avantageusement, les lactoreplaceurs sont des produits en poudre d'origine laitière composés principalement de protéines d'origine sériques et comprenant 20% à

40% de protéines.

Les pourcentages mentionnés sont donnés de poids en poids.

5 Différentes matières sucrantes ont été testées en remplacement du saccharose, ces matières étant de poids moléculaire plus faible pour abaisser le point de congélation.

Trois types de mélanges de matières sucrantes ont été déterminés à cet effet qui donnent sensiblement le même
10 résultat au niveau de la texture cuillérable mais différent par la saveur sucrée.

Le premier mélange ou première combinaison comprend un pourcentage total de sucres exprimés par rapport à la formule globale de 24,6% en matières sèches, dont :

- 15
- dextrose ou fructose : 8,2%,
 - sucre inverti : 8,2%,
 - sirop de glucose : 8,2%.

Avec ce type de mélange, la saveur sucrée est assez accentuée.

20 Le deuxième mélange ou deuxième combinaison présente un pourcentage total de sucres exprimés par rapport à la formule globale de 20,3% en matières sèches dont :

- 25
- dextrose ou fructose : 10,0%,
 - sucre inverti : 3,3%,
 - sirop de glucose : 7,0%.

Avec ce deuxième type de mélange, la saveur sucrée est moins intense qu'avec le premier.

30 Le troisième mélange ou troisième combinaison d'agents sucrants comprend un total de sucres exprimés par rapport à la formule globale de 20,3% en matières sèches, dont :

- dextrose ou fructose : 13,3%,
- sirop de glucose : 7,0%.

35 Le sirop de glucose utilisé a une composition hydrocarbonnée comprenant environ 49% de glucose et 26% de saccharides.

Le sucre inverti est caractérisé par un degré d'inversion élevé (pourcentage de saccharose hydrolysé) de l'ordre de 93% plus ou moins 3%.

Le sirop de glucose utilisé présente un dextrose équivalent

de l'ordre de 70% par exemple compris entre 69,7% et 73,7%.

Il est possible dans le cadre de l'invention d'utiliser un sirop de glucose à bas dextrose équivalent par exemple entre 35% à 70%, par exemple les sirops de glucose
5 utilisés peuvent donc avoir un dextrose équivalent compris aux alentours de 40% et une composition glucidique avec par exemple, 15% de dextrose et 10% de disaccharides, et un dextrose équivalent compris aux alentours de 70% et une composition glucidique avec par exemple 28% de dextrose et
10 50% de disaccharides, ou 49% de glucose et 26% de disaccharides.

Les différentes combinaisons de substances sucrantes sont données en dextrose équivalent global donné par le pourcentage de dextrose monohydraté d'une part et le
15 pourcentage de dextrose présent dans le sirop de glucose.

Les combinaisons de matière sucrante ont en commun leur dextrose équivalent et il est possible dans le cadre de l'invention, d'utiliser un sirop de glucose à bas dextrose équivalent.
20 Le pourcentage de dextrose global (provenant du dextrose monohydraté standard et du sirop de glucose) se situe entre 6% et 30%.

Il a été observé que plus on augmente le pourcentage de dextrose, plus le produit obtenu est souple et malléable.
25

Il est possible d'utiliser du fructose en substitution totale ou partielle du dextrose ; le résultat obtenu est satisfaisant au niveau de la texture avec cependant, un goût plus sucré.

De même, le sucre inverti peut être utilisé en substitution totale ou partielle du dextrose et donne de bons résultats au niveau texture.
30 Cependant, dans ce cas, le goût sucré prononcé doit être caché par incorporation, par exemple, de substances amérisantes.
35

La matière grasse utilisée est l'un des principaux facteurs jouant sur la texture finale du produit et dans l'obtention d'une texture qui ne soit pas, à température de congélation, trop ferme.

Différents essais ont démontré que la matière grasse à bas point de congélation la plus apte était l'huile de tournesol dont la solidification débute à environ moins cinq degrés centigrades pour être totale à environ moins vingt cinq degrés centigrades.

Cette huile est caractérisée par un bas point de fusion.

Les pourcentages d'incorporation optimum pour parvenir au résultat escompté sont compris entre 6% et 24%. En dessous de 6%, le produit obtenu est trop ferme, ce qui notamment le rend impropre à un conditionnement en récipient sous pression.

Au-delà de 24%, le produit obtenu est malléable mais avec un aspect filant et il commence à devenir limite au niveau du goût avec un goût de gras un peu trop persistant.

Entre 6% et 24%, plus on augmente la proportion d'huile de tournesol et plus la glace est souple et fluide et plus elle a de corps en bouche lors de la dégustation. Il va de soi que d'autres matières grasses d'origine végétale à caractéristiques équivalentes à celles de l'huile de tournesol sont susceptibles d'être utilisées.

Une composition type du produit selon l'invention peut être la suivante :

- huile de tournesol : 16,5% à 18,5%,
- lait écrémé en poudre :
(ou lactoremplacéur) : 11,6% à 10%,
- dextrose : 13,3%,
- sirop de glucose : 8,8%,
- stabilisant : 0,6% à 0,3%,
- lait écrémé liquide : 49,0% à 49,1%.

Pour obtenir une substance suffisamment souple, il est apparu préférable de combiner un taux élevé de matières grasses, quand le taux de substance sucrante est dans le bas de la fourchette et un taux de substance sucrante élevé quand le taux de matière grasse est dans le bas de la fourchette.

On peut, par exemple, avoir les compositions suivantes :

- | | |
|-------------------------------|----------------------------|
| - huile de tournesol : 20% | huile de tournesol : 15% |
| - lait écr. en poudre : 11,6% | lait écr. en poudre : 11,6 |
| (ou lactoremplacéur) | (ou lactoremplacéur) |

- dextrose :	10%	dextrose :	15%
- sirop de glucose :	8,8%	sirop de glucose :	8,8%
- stabilisant :	0,6%	stabilisant :	0,6%
- lait écr. liquide :	49%	lait écr. liquide :	49%

Suivant une autre forme de réalisation de l'invention, il est possible d'intégrer à la composition des polyols ou sucre alcool.

A titre d'exemple, un sorbitol peut être ajouté dans une proportion de 3 à 5% ; dans ce cas, la proportion de dextrose passe de 13,3% à 10,3%.

Il est apparu également possible d'utiliser des substances comme des polyols, de l'éthanol ou même des sucres comme le galactose qui seraient susceptibles de diminuer le point de congélation.

La mise en oeuvre des ingrédients s'effectue en préparant tous les constituants sous forme liquide, le lait écrémé liquide et l'huile de tournesol.

Les constituants liquides sont soumis à un mélange à chaud sous l'action d'un agitateur.

Sont alors apportés le lait écrémé en poudre et les stabilisants en poudre.

Les stabilisants sont un mélange de mono et diglycérides d'acides gras avec éventuellement de la caroube, guar, carraghénates, alginates, gélatine, etc...

Les stabilisants sont choisis de façon à adapter la texture et la stabilisation du dessert glacé.

Cet apport se fait sous agitation. Il est préférable de porter le mélange à une température d'au moins 65°C à 70°C centigrades, avant d'ajouter les sucres, afin de bien soubiliser les agents stabilisants.

Les sucres sont alors ajoutés et la température est portée ou maintenue aux alentours de 70°C.

L'extrait sec est alors ajusté aux alentours de 45% avec de l'eau si nécessaire.

Il est également possible de ne chauffer que le lait écrémé liquide et d'ajouter l'huile de tournesol après le lait écrémé en poudre et le stabilisant.

La préparation est ensuite homogénéisée au moyen d'un homogénéisateur pour obtenir une distribution homogène de globules gras de petit diamètre. On peut pratiquer une

homogénéisation avant et après le traitement thermique.

L'homogénéisation a une importance sur la stabilité du produit lorsqu'il est sous forme non congelé.

5 Elle est également importante pour la texture finale du produit. Une technique intéressante pour avoir des globules gras de taille correcte sans changer la texture est de réaliser une préémulsion de tous les ingrédients sauf les substances sucrantes.

10 La pression d'homogénéisation se situe de 25 bars à 200 bars.

La préparation est ensuite soumise à maturation pendant un temps variant de quelques heures à une nuit en froid positif par exemple à +3°C. Cette maturation peut s'effectuer
15 conjointement à un brassage du produit.

La préparation peut ensuite être surgelée directement avec un foisonnement conjoint ou traitée UHT puis mise en récipient sous pression et surgelée ensuite.

La préparation peut subir un traitement de type UHT en
20 direct par injection de vapeur ou pulvérisation dans de la vapeur.

La mise en récipient sous pression peut également être effectuée directement après pasteurisation ou traitement UHT, la maturation et la congélation intervenant
25 ensuite.

La surgélation s'effectue en enceinte réfrigérée entre -18°et -24°. La conservation du produit obtenu s'effectue en enceinte réfrigérée à température comprise entre moins 18°centigrades et moins 24°centigrades.

30 Le conditionnement peut en fonction des conditions de commercialisation et d'emploi être effectué en pot ou en récipient sous pression.

Les récipients sous pression peuvent être du type siphon ou du type bombe à pression. Dans ces cas, un gaz foisonneur
35 est injecté dans le produit, celui-ci est généralement un gaz neutre du type protoxyde d'azote.

Un gaz propulseur, par exemple de l'azote, est également injecté jusqu'à la pression nécessaire dans le récipient.

REVENDECATIONS :

1. Dessert glacé dont la composition comprend des protéines d'origine laitière, des matières grasses, des matières sucrantes, un ou des agents stabilisants caractérisé en ce que :

- les protéines sont apportées par des produits lacto-remplaceurs d'origine laitière et/ou du lait écrémé comprenant 20 à 40% de protéines par rapport au produit brut ;
- la matière grasse est une huile d'origine végétale à bas point de fusion ;
- les matières sucrantes sont constituées par un mélange d'agents sucrants à faible poids moléculaire, ledit mélange comprenant dextrose et/ou fructose, sucre inverti et sirop de glucose.

2. Dessert glacé selon la revendication 1 dont la composition comprend :

- des protéines d'origine laitière,
 - des matières grasses,
 - des matières sucrantes,
 - un ou des agents stabilisants,
- caractérisé en ce que :
- les protéines sont apportées par des produits lacto-remplaceurs d'origine laitière et/ou du lait écrémé comprenant 20 à 40% de protéines par rapport au produit brut ;
 - les matières sucrantes sont un mélange d'agents sucrants à faible poids moléculaire, ledit mélange comprenant :
 - dextrose et/ou fructose,
 - sucre inverti,
 - sirop de glucose, dans lequel le sucre inverti a un pourcentage d'inversion élevé de l'ordre de 93 plus ou moins 3 et le sirop de glucose a un dextrose équivalent de l'ordre de 70%.

3. Dessert glacé selon la revendication 1 caractérisé en ce que :

- les lactoreplaceurs comprennent de 20 à 40% de protéines par rapport au produit brut.

4. Dessert glacé selon la revendication 1

caractérisé en ce que l'huile végétale est une huile à bas point de fusion.

5 5. Dessert glacé selon la revendication 1 caractérisé en ce que l'huile végétale est une huile de tournesol.

6. Dessert glacé selon la revendication 1 caractérisé en ce que le sucre inverti utilisé se caractérise par un pourcentage de degré d'inversion élevé de 10 l'ordre de 93 plus ou moins 3.

7. Dessert glacé selon la revendication 1 caractérisé en ce que le sirop de glucose a un dextrose équivalent de l'ordre de 70%.

8. Dessert glacé selon la revendication 1 15 caractérisé en ce que le sirop de glucose a une composition hydrocarbonée comprenant 49% de glucose et 26% de saccharides.

9. Dessert glacé selon la revendication 1 et l'une quelconque des revendications 2 à 3 caractérisé en ce qu'il 20 comprend :

- huile de tournesol : 16,5% à 18,5%,
- lait écrémé en poudre :
(ou lactoreplaceur) : 11,6% à 10%,
- dextrose : 13,3%,
- 25 - sirop de glucose : 8,8%,
- stabilisant : 0,6% à 0,3%,
- lait écrémé liquide : 49% à 49,1%.

10. Dessert glacé selon la revendication 9 caractérisé en ce que le mélange d'agents sucrants présente 30 un pourcentage total de sucres exprimés par rapport à la formule globale de 24,6% en matières sèches, dont :

- dextrose ou fructose : 8,2%,
- sucre inverti : 8,2%,
- sirop de glucose : 8,2%.

35 11. Dessert glacé selon la revendication 1 caractérisé en ce que le mélange d'agents sucrants présente un pourcentage total de sucres exprimés par rapport à la formule globale de 20,3% en matières sèches, dont :

- dextrose ou fructose : 10,0%,
- sucre inverti : 3,3%,

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- sirop de glucose : 7,0%.

12. Dessert glacé selon les revendications 1 et 2 caractérisé en ce que le taux de protéines est compris entre 6 à 18%.

13. Dessert glacé selon la revendication 1 caractérisé en ce que l'agent stabilisant est incorporé dans une proportion comprise entre 0,25% à 0,8%.

14. Dessert glacé selon la revendication 1 caractérisé en ce que le mélange d'agents sucrants comprend un total de sucres exprimés par rapport à la formule globale de 20,3% en matières sèches, dont :

- dextrose ou fructose : 13,3%,

- sirop de glucose : 7,0%.

15. Procédé de fabrication d'un dessert glacé mettant en oeuvre les composants selon les revendications 1 à 14 caractérisé en ce que :

- le lait écrémé liquide et l'huile sont mélangés (sous forme liquide) et conjointement chauffés ;

- le lait écrémé en poudre et l'agent stabilisant sont alors apportés, le mélange étant porté à une température de préférence de 65°C à 70°C;

- les agents sucrants sont ajoutés de préférence lorsque le mélange est à 70°C;

- l'extrait sec est ajusté aux alentours de 45% d'eau si nécessaire ;

- la préparation est homogénéisée ;

- la préparation subit une maturation sous froid positif avec éventuellement une agitation ;

- la préparation est surgelée pour avoir une température finale comprise entre -18°C et -24°C.

16. Procédé de fabrication selon la revendication 15 caractérisé en ce que le mélange peut être conditionné sous pression.

17. Procédé de fabrication selon les revendications 15 et 16 caractérisé en ce que le conditionnement sous pression s'effectue après maturation du mélange et avant surgélation.

18. Procédé de fabrication selon les revendications 15 et 16 caractérisé en ce que le conditionnement sous

pression s'effectue après surgélation et foisonnement.

19. Procédé de fabrication selon la revendication 15 caractérisé en ce que le mélange est conditionné à la pression atmosphérique en pots après surgélation et foisonnement.

20. Dessert glacé selon la revendication 1 et l'une quelconque des revendications 2 à 14 caractérisé en ce que le produit est cuillérable à moins 20° sans nécessité d'être foisonné.

21. Dessert glacé selon la revendication 1 caractérisé en ce que le pourcentage de dextrose global des substances sucrantes (provenant du dextrose monohydraté standard et du sirop de glucose) se situe entre 6% et 30%.

22. Dessert glacé selon les revendications 1 et 2 caractérisé en ce que le taux de matière grasse se situe entre 6% et 24%.

23. Dessert glacé selon les revendications 21 et 22 caractérisé en ce que le taux de matière grasse est élevé quand le taux de substances sucrantes est dans le bas de la fourchette.

24. Dessert glacé selon les revendications 21 et 22 caractérisé en ce que le taux de substances sucrantes est élevé quand le taux de matière grasse est dans le bas de la fourchette.

25. Dessert glacé selon la revendication 1 caractérisé en ce que le sirop de glucose a un dextrose équivalent compris entre 35% et 70%.

26. Dessert glacé selon la revendication 1 caractérisé en ce que les sirops de glucose utilisés ont un dextrose équivalent compris aux alentours de 40% et une composition glucidique avec par exemple 15% de dextrose et 10% de disaccharides.

27. Dessert glacé selon la revendication 1 caractérisé en ce que les sirops de glucose ont un dextrose équivalent compris aux alentours de 70% et une composition glucidique avec par exemple 28% de dextrose et 50% de disaccharides ou 49% de glucose et 26% de disaccharides.

INTERNATIONAL SEARCH REPORT

File: Int'l Application No
PCT/FR 97/00338

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A23G9/02 A23G9/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A23G

Documentation searched other than newspaper documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 400 406 A (R. G. MORLEY ET AL.) 23 August 1983	1,3-5, 12,13, 20,22,25 15
Y	see column 3, line 40-68; claims 7,14,15; examples see column 5, line 41 - column 6, line 30 see column 7, line 1 - column 8, line 31	
Y	US 5 084 295 A (R. H. WHELAN ET AL.) 28 January 1992 see column 6, line 8 - line 11; claims 1,9; examples 1,2 see column 20, line 36 - line 51 --- -/-	15

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
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- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is considered with one or more other such documents, such combination being obvious to a person skilled in the art.
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Date of the actual completion of the international search

28 May 1997

Date of mailing of the international search report

13.06.97

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INTERNATIONAL SEARCH REPORT

Date: Int'l Application No.
PCT/FR 97/00338

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 421 778 A (M. L. KAHN ET AL.) 20 December 1983	1,2, 20-22, 25,27 3
A	see claims 1,3,5-7,12-15,31-34; examples see column 4, line 47 - line 58 see column 1, line 33 - column 2, line 17 see column 3, line 35 - column 5, line 56 ---	
A	US 4 244 977 A (M. L. KAHN ET AL.) 13 January 1981 see column 12, line 61 - column 13, line 56; claims see column 2, line 3 - line 34 see column 4, line 31 - line 57 ---	1,15, 20-22
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Int. Application No.

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International Application No

PCT/FR 97/00338

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INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No.

PCT/FR 97/00338

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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RAPPORT DE RECHERCHE INTERNATIONALE

Des : Internationale No

PCI/FR 97/00338

A. CLASSEMENT DE L'OBJET DE LA DEMANDE
 CIB 6 A23G9/02 A23G9/04

Selon la classification internationale des brevets (CIB) ou à la fois selon la classification nationale et la CIB

B. DOMAINES SUR LESQUELS LA RECHERCHE A PORTE

Documentation manuelle consultée (système de classification sans des symboles de classement)

CIB 6 A23G

Documentation consultée autre que la documentation manuelle dans la mesure où ces documents relèvent des domaines sur lesquels a porté la recherche

Base de données électronique consultée au cours de la recherche internationale (nom de la base de données, et si cela est réalisable, termes de recherche utilisés)

C. DOCUMENTS CONSIDERES COMME PERTINENTS

Catégorie	Identification des documents cités, avec, le cas échéant, l'indication des passages pertinents	no. des références citées
X	US 4 400 406 A (R. G. MORLEY ET AL.) 23 Août 1983	1,3-5, 12,13, 20,22,25 15
Y	voir colonne 3, ligne 40-68; revendications 7,14,15; exemples voir colonne 5, ligne 41 - colonne 6, ligne 30 voir colonne 7, ligne 1 - colonne 8, ligne 31	
Y	US 5 084 295 A (R. H. WHELAN ET AL.) 28 Janvier 1992 voir colonne 6, ligne 8 - ligne 11; revendications 1,9; exemples 1,2 voir colonne 20, ligne 36 - ligne 51 --- -/-	15

<input checked="" type="checkbox"/> Voir la suite du cadre C pour la fin de la liste des documents	<input checked="" type="checkbox"/> Les documents de familles de brevets sont indiqués en annexe
* Catégories spéciales de documents cités:	
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Date à laquelle la recherche internationale a été effectivement achevée <div style="text-align: center; font-weight: bold;">28 Mai 1997</div>	Date d'expédition du présent rapport de recherche internationale <div style="text-align: center; font-weight: bold;">13. 06. 97</div>
Nom et adresse postale de l'administration chargée de la recherche internationale Office Européen des Brevets, P.B. 5818 Patentaan 2 NL - 2280 HV Rijswijk Tél.: (+ 31-70) 340-2040, Tx: 31 651 epo nl, Fax: (+ 31-70) 340-3016	Fonctionnaire autorisé <div style="text-align: center; font-weight: bold;">Guyon, R</div>

RAPPORT DE RECHERCHE INTERNATIONALE

Des Internationale No
PCT/FR 97/00338

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De : z internationale No

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Europäisches Patentamt
European Patent Office
Office européen des brevets



Publication number: 0 509 967 A2

(12)

EUROPEAN PATENT APPLICATION

(21) Application number : 92830166.2

⑤ Int. Cl.⁶: A23G 9/28

(22) Date of filing : 02.04.92

(33) Priority : 05.04.91 IT MC910024

④3 Date of publication of application :
21.10.92 Bulletin 92/43

64 Designated Contracting States :
AT BE CH DE DK ES FR GB GR LI LU MC NL PT
SE

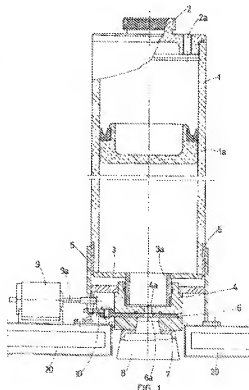
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⑤④ Dispensing machine for creamy ice-cream.

(57) This invention concerns a device for the automatic dosing of creamy hand made ice-cream consisting of a container in which the ice cream is submitted to the action of a compressed air piston which tends to push it constantly towards the outflow opening on the bottom of the container; said outflow opening has a mechanism which temporarily widens the opening so that the ice cream may be supplied - and then closes it.



This design patent for an industrial invention concerns a device for the automatic distribution of creamy hand made ice cream.

Currently hand made ice cream can only be served manually by an operator who uses a spoon to lift the ice cream from the containers or barrels in refrigerated counters.

As a matter of fact, a number of automatic ice cream distributing devices having an internal container and a nozzle through which the product drops onto a cone or cup, already exist; it should be noted however that these devices can be used only with ice cream which is not extremely creamy, like cream or powder based ice creams.

These devices absolutely can not be used with hand made ice cream which is too thick and creamy; said devices in fact can not provide sufficient pressure to push a dose of this type of ice cream through the nozzle.

The device according to the invention was designed for this reason and is therefore an absolute novelty in that it can automatically distribute hand made ice creams which up to now it has only been possible to distribute by hand.

The invention in question is also designed to display the ice creams distributed automatically so as to continue attracting the attention of potential consumers to the ice-cream.

The device according to the invention consists of a transparent cylindrical element (the container of the ice cream) with a supply mouthpiece at the bottom and closed at the top with a cover having a hole into which a compressed air pipe is coupled; the compressed air pushes - from top to bottom - a sealed piston fitted inside the element, on the ice cream so that the same gradually moves downwards.

Said element must be coupled - vertically - on a hollow base housing the product dosing mechanisms.

Said mechanisms may consist of a gate system which releases the outflow section of the supply mouthpiece for the length of time required to distribute a portion of ice cream, which in this case will consist of a uniform and continuous jet having a variable cross-section corresponding to that of the supply mouthpiece.

As an alternative to this dosing system, the device in question can include another system which supplies regular balls of ice cream from the mouthpiece of the element.

The entire device according to the invention can be installed in large refrigerated stands and can house numerous cylinders of ice cream in different flavours and colours - from which the consumer himself can distribute the ice cream of his choice by means of a coin box; it follows therefore that by inserting a coin in each distributing device it will be possible to operate - by means of buttons or levers - the dosing mechanisms of each cylinder.

It should be noted that the above cylinders can be made with a double concentric transparent wall which creates a space around the actual ice cream container, and which can be filled with gas at a low temperature; in this case it is evident that this type of cylinder can even be used outside the above refrigerated counters.

For major clarity the description continues with reference to the drawings which are intended for purposes of illustration and not in a limiting sense, where:

- figure 1 is a vertical axial plane cross-section of the device in question in the version with gate dosing device;

- figure 2 is a vertical axial plane cross-section of the device in question in the version with opening dosing device;

- figure 3 is a side view orthogonal to figure 2 of only the opening dosing system;

- figure 4A, 4B, and 4C show three different positions of the gears in the above opening dosing device during the same number of operating phases.

With reference to figure 1 the device in question consists of an ice-cream container (1) having a cylindrical structure made of transparent material and closed at the top by a cover (2) and at the bottom by a bottom plate (3) having a mouthpiece (3a) at the centre which can be coupled - by means of a bayonet attachment - to a cylindrical housing (4) with a hole at the centre of its bottom and supported by a collar shaped base (5) into whose top edge the element (1) fits.

The latter houses a piston (1a) which during operation is subject to the constant pressure of compressed air which is introduced in the top chamber of the cylinder (1) - between the cover (2) and the piston (1a) - through the hole (2a) of the cover (2) in which the pipe is fitted.

At the bottom of the cylindrical housing (4) of the base (5) there is a horizontal gate (6) supported by a plate (7) having a hole at the centre under which a centering bell (8) is applied for the cone or cup to be filled with ice cream.

The above gate (6) automatically performs alternate horizontal translations thanks to the action of a double action actuator (9) whose rod (9a) is attached to the gate (6) by means of an intermediate connection bracket (10).

Obviously the gate (6) has an hole at the middle (8a) corresponding to that (4a) on the bottom of the overlying cylindrical housing (4); the alignment of these two holes will obviously allow the ice cream to be distributed from the cylinder (1) while if the gate (6) is moved out of said hole alignment (8a) and (4a), supply of the product will be interrupted.

Obviously the amount of ice cream distributed will depend on the time for which the hole (8a) of gate (6) is kept aligned with hole (4a) of the overlying cylindrical

cal housing (4).

With reference to the following figures, the device according to the invention can use an ice cream dosing system with oscillating opening.

In particular for the realization of this solution, a module (M) consisting of a prism-shaped hollow body (11) containing a cylindrical drum (12) with horizontal axis whose shaft (12a) is coupled to an oscillating actuator (13) outside the module (M), is mounted between the bottom face of the cylindrical housing (4) and the centering bell (8).

The side surface of the drum (12) has a hemispherical recess (12b) inside which a semicircular oscillating blade (14) can oscillate, skimming over the surface, supported by two horizontal diametrically opposing coaxial pins (14a); one of these horizontal pins has a keyed pinion (15) which engages with a circular toothed section (16) fitted loose on the shaft (12a) of the drum (12) and interferes with a tension pin (17), which is subject to the constant pressure of an expulsion spring (17a) which is fitted precompressed into the housing of the pin (17) on the side face of the drum (12).

A spiral torsion spring (18) fitted on the shaft (12a) and hooked to the other end of the support of the shaft (12a), is fitted to the toothed circular section (16).

Regarding the operation of the module (M) it should be remarked that when necessary ice-cream is to be supplied from the cylinder (1), the oscillating actuator (13) rotates the shaft (12a) of the drum (12) 180° so as to position the recess (12b) filled with ice cream - which when at rest stops at the top dead point illustrated in figure 2, constantly filled with ice cream - above the centering bell (8).

To allow the detachment of the ball of ice cream held in the recess (12b), the semicircular blade (14) is activated automatically scraping the internal walls of the recess (12) and detaching the ball of ice cream which will then drop on the cone or cup in the centering bell (8).

With particular reference to figures 4A, 4B and 4C, a description is now given of the mechanism which operates the above semicircular blade (14).

During its rotation towards the bottom of the recess (12b), the tension pin (17) interferes with the rotation of the toothed circular section (16) and consequently winds the spiral torsion spring (18).

Once the recess (12b) has reached its bottom dead point, a cam (19) makes the pin (17) return into its housing just enough to release the toothed circular section (16), which therefore thanks to the movement provided by the unwinding of the spiral torsion spring (18), rotates the pinion (15) 180° together with the pin (14a) which supports and actuates the blade (14).

The recess (12b) then returns to its top dead point thanks to be actuator (13) which actuates the shaft (12a) of the drum (12); in said phase the semicircular blade (14) also returns to its position at rest thanks to the rotation of the pinion (15) engaging with the tooth-

ed circular section (16).

In Figures 1 and 2 the display stand plane on which the device according to the invention must be installed has been indicated with the number (20).

Claims

1) A device for the automatic dosing of creamy ice cream consisting of a cylindrical ice-cream container (1), closed at the top by a cover (2) and at the bottom by a bottom plate (3) housing a piston (1a) subject constantly, during operation, to the pressure of compressed air which is introduced into the top chamber of the cylinder (1) - namely that compressed between the cover (2) and the piston (1a) - through the hole (2a) of the cover (2) in which the pipe is fitted; at the centre of the above bottom plate (3) there is a mouth-piece (3a) at the centre which can be coupled - by means of a bayonet attachment - to a cylindrical housing (4) having a hole at the centre of its bottom supported by a collar shaped base (5) into whose top edge the container fits (1); at the bottom of said cylindrical housing (4) of the base (5) there is a horizontal gate (6) - having a hole at the centre (6a) corresponding to the hole on the bottom of the same cylindrical housing (4) - which can automatically perform alternating horizontal translations to start or stop the supply of ice cream from the container (1) thanks to the action of a double action actuator (9) whose rod (9a) is hooked to the gate (6) by means of an intermediate connection bracket (10), said gate is supported by a support plate (7) having a hole at the centre under which a centering bell (8) is applied for the cone or the cup which is to be filled with ice cream supplied from the container (1).

2) A device for the automatic dosing of creamy hand made ice cream according to claim 1, consisting in its preferred embodiment, of a module (M) having a prism shaped hollow body (11) containing a cylindrical drum (12) with a horizontal axis, whose shaft (12a) is coupled to an oscillating actuator (13) outside the module (M), mounted between the bottom face of the cylindrical (4) and the centering bell (8); the side surface of the drum (12) has a semi-spherical recess (12b) inside of which an oscillating semi-circular blade (14) can swing, skimming the surface, supported by two coaxial and diametrically opposing horizontal pins (14a), one of which has a keyed pinion (15) engaging with a toothed circular section (16) fitted loose on the shaft (12a) of the drum (12) and interfering with a tension pin (17), constantly subject to the pressure of an expulsion spring (17a) fitted precompressed into the housing of the pin (17) on the side face of the drum (12); a spiral torsion spring (18) fitted on the shaft (12a) and hooked, at the other end, on the support of the shaft (12a) is hooked to the toothed circular section (16).

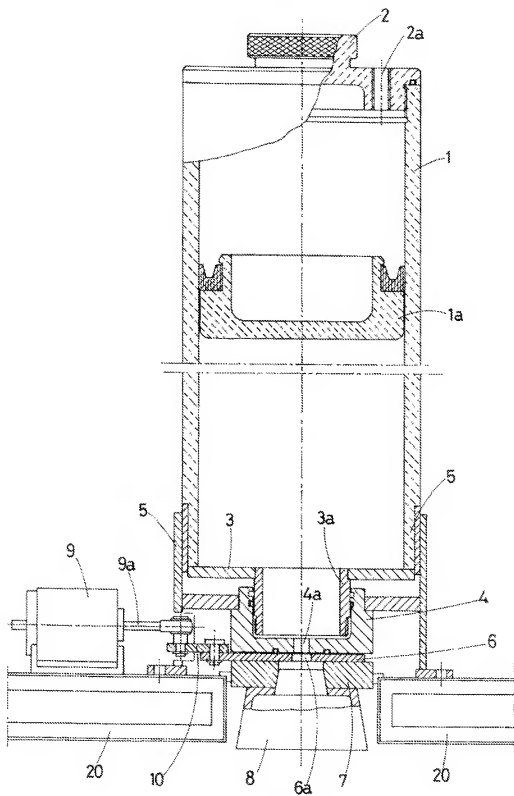


FIG. 1

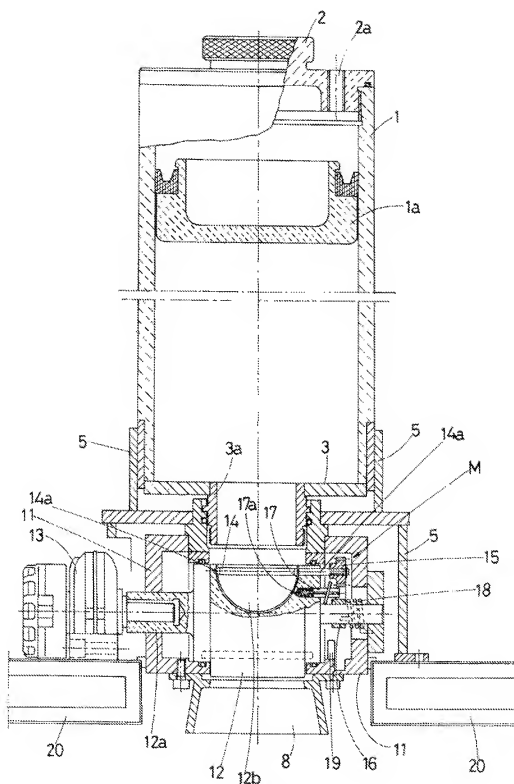
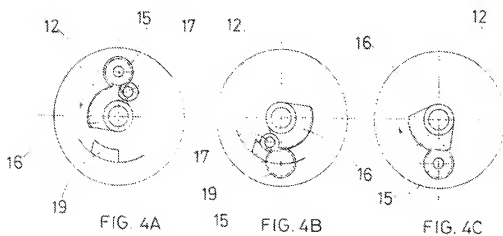
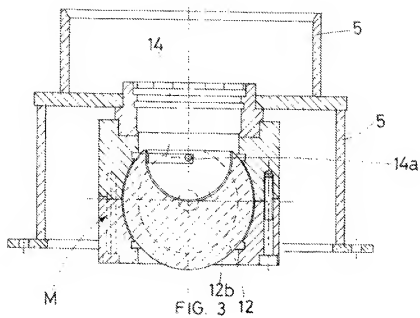


FIG. 2





(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
13.03.1997 Bulletin 1997/33

(51) Int. Cl.⁶: A23C 9/15, A23C 13/14,
A23C 9/154, A23G 1/00

(21) Application number: 97100655.6

(22) Date of filing: 17.01.1997

(84) Designated Contracting States:
BE CH DE ES FR GB IT LI NL

(30) Priority: 18.01.1996 JP 6912/96
25.07.1996 JP 196687/96

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(54) Delactosed milk and delactosed milk powder, and foodstuffs containing the same and process therefor

(57) Major components of the delactosed milk and the delactosed milk powder according to the present invention may comprise a protein essentially consisting of milk protein and fats essentially consisting of milk fat but not include lactose of more than 2%. The delactosed milk and the delactosed milk powder are characterized by having a structure where the fat is conjugated with the protein. This structure has been obtained by homogenizing the fat and the protein in an aqueous solution and in a fat to protein ratio from 0.33 to 3.0 thereby to form a stable O/N emulsion structure.

Description

BACKGROUND OF THE INVENTION

5 The present invention relates to de-lactose milk and de-lactose milk powder which are reconstructed with milk proteins and milk fats as major components free or almost free of lactose, and to processes for producing the said de-lactose milk, and de-lactose milk powder.

The de-lactose milk and de-lactose milk powder according to the present invention may be used as substitutions by processed milk, whole milk powder and skim milk powder for foodstuffs of confectioneries such as chocolate having 10 milk flavour, candy, biscuit and the like, ice cream, sherbet, milk coffee and milk tea. Thus, the present invention also relates to the foodstuffs consisting of confectionery, beverage and ice which include the de-lactose milk and de-lactose milk powder.

In the present invention, foodstuffs means the confectioneries such as chocolate having milk flavour, candy and biscuit and the like, the ice such as ice cream and sherbet, and the drinks such as milk coffee and milk tea.

15 Hitherto, whole milk powder and skim milk powder as components derived from fresh milk have been used for foodstuffs, for example, milk chocolate and ice cream spontaneously containing components from milk. In consideration of the antiobesity and promotion of the health, the foodstuffs are required to be low-calorie and sugar-less or sugar-free, wherein sugar-less foodstuffs mean foodstuffs in which contents of monosaccharides and disaccharides are less than 0.5%.

20 However, foregoing whole milk powder and skim milk powder contain large amounts of lactose, for example, about 40% in whole milk powder and about 50% in skim milk powder. Therefore, even if sugar derived from other materials is substituting with sugar alcohol, the resulting foodstuffs still contain considerable amounts of lactose. The commodities exist not only in Japan but also in foreign countries, although these are not sugar-less in the strict sense of word.

25 Processed milk and powdered milk of lactose free or of less content of lactose for satisfying the definition of "sugar-less" when used for the foodstuffs have never been reported. Thus, for example, in the field of chocolate, only black chocolate using sugar alcohol could satisfy the definition of "sugar-less".

Butter or casein protein may be used as substitutions for whole milk powder and skim milk powder although they are not superior to whole milk powder and skim milk powder in taste and feel even when applied for milk chocolate in 30 their entires.

SUMMARY OF THE INVENTION

It is, therefore, an objection of the invention to provide novel processed milk and powdered milk, or de-lactose milk and de-lactose milk powder free or almost free of lactose but may be used as the substitutes for whole milk powder, 35 skim milk powder, processed milk and the like, and the process for production thereof. Furthermore, the present invention provides the foodstuffs containing the de-lactose milk and/or the de-lactose milk powder obtained according to the invention. The foodstuffs containing the de-lactose milk and the de-lactose milk powder may satisfy the definition of sugar-less in the strict sense.

40 It is, therefore, another object of the invention to provide the foodstuffs which are not only low-calorie and sugar-less but also hold taste and feel of conventional foodstuffs with promoted health.

To achieve the foregoing objects, major components of the de-lactose milk and the de-lactose milk powder according to the present invention may comprise a protein essentially consisting of milk protein and fats essentially consisting of milk fat but not include lactose of more than 2%. The de-lactose milk and the de-lactose milk powder are characterized 45 by having a structure where the fat is conjugated with the protein.

The protein which is one of major components of the de-lactose milk and the de-lactose milk powder according to the invention is preferably a milk protein derived from the fresh milk and include casein, albumin, WPC (whey protein concentrate) and the like. In proteins from the fresh milk, however, the most preferable proteins are TMP (total milk proteins) and MPC (milk protein concentrate) which contain both casein and albumin rather than only casein or albumin. 50 Proteins other than milk proteins, for example, soybean proteins may be used, although co-uses with milk proteins of more than 50% and further with milk flavour are required to enhance the milky taste. Thus, the protein which is one of major components of the de-lactose milk and the de-lactose milk powder according to the present invention comprises one or more of the aforementioned protein materials and contains milk proteins from the fresh milk of more than 50%.

The fat which is another major component of the de-lactose milk and the de-lactose milk powder of the present invention may preferably be of one or more milk fats from the fresh milk and selected from the group of fresh cream, 55 butter and butter oil, and may optionally include vegetable fats, although milk fats from fresh milk of more than 50% may preferably be contained. When the fresh cream is selected as source of the fat, very small amount of lactose may be contained. When the butter and/or butter oil are used, lactose may not be contained. Thus, the de-lactose milk and the de-lactose milk powder free of lactose may be produced when the butter and/or butter oil are selected as source of the fat.

In the de-lactose milk and the de-lactose milk powder, ratio of the fat to the protein (F/P) may preferably be in the range from 0.33 to 3.0. Too much fat leads to substantially the same taste and feel as those of the butter only added to the foodstuffs, and too much protein, for example, used to chocolate leads to deterioration of the feel.

Milk ash may be contained as a trace of the de-lactose milk and the de-lactose milk powder according to the present invention. The preferable milk ash is milk serum mineral, although another mineral materials may be used.

The de-lactose milk and the de-lactose milk powder of the present invention may also include a bulking agent of soluble dietary fiber and / or sugar alcohol for the substitutes by lactose so as (i) to dry efficiently, (ii) to retain the taste, (iii) prevent the degradation of milk and (iv) to improve the feel when applied to chocolate and the like. As the bulking agent, the soluble dietary fiber such as polydextrose, inulin, indigestible dextrin and the like, the sugar alcohol such as lactitol, palatinit[®] (isomalt), maltitol, erythritol and the like or mixture thereof may be used. The bulking agent of soluble dietary fiber and / or sugar alcohol may optionally be added with content up to 2.5 of maximum ratio to total amount of the protein and the fat by weight, preferably from 0.5 to 2.5 when employed. If the content is more than 2.5, mixing amount is unpreferably limited. If the content is less than 0.5, an effect of the addition is not obtained.

One method of obtaining the de-lactose milk of the present invention comprises steps of suspending powders of the fat and the protein which are major components in aqueous solution for homogenization and of reconstructing a structure in which the fat is conjugated with the protein for obtaining a mixture of a stable O/W emulsion structure. Then, the emulsified mixture thus obtained is dried and pulverized to obtain the de-lactose milk of the present invention.

The foregoing bulking agent may be added to the step emulsifying the fat and protein in aqueous solution for obtaining the further stable O/W emulsion structure. The bulking agent also has a function of performing a convenient pulverization when the de-lactose milk powder is produced. When the spray drying method is applied to the drying and powdering steps for pulverization, the bulking agent preferably contains at least polydextrose.

The foodstuffs containing the de-lactose milk and the de-lactose milk powder according to the present invention may be produced with use of the regular processes for producing the respective foodstuffs by employing the de-lactose milk and the de-lactose milk powder in substitution by skim milk, whole milk powder and processed milk.

When the de-lactose milk and the de-lactose milk powder of the present invention are used for the sugar-less foodstuffs, one or more sugar alcohols selected from the group consisting of lactitol, palatinit[®] (isomaltitol) and maltitol may preferably be used as a sweetener. Those sugar alcohols have an effect of enhancing milk flavour of the foodstuffs. Furthermore, one or more compounds selected from the group consisting of the soluble dietary fiber such as polydextrose, inulin and indigestible dextrin, and sorbitol may additionally be used. The ratio of the sugar alcohol (including sorbitol when combined) to the soluble dietary fiber by weight may preferably be more than 0.5 and more preferably more than 1.

Further, when the de-lactose milk and the de-lactose milk powder according to the invention are used for sugar-less chocolate such as the low-calorie and/or low-carious sugar-less chocolate using erythritol and/or xylitol, not only the low-calorie and/or low-carious property may remain but also an improvement of sweetness may be obtained. The de-lactose milk containing the bulking agent according to the present invention may preferably be included with content of more than 5% by weight.

The de-lactose milk and the de-lactose milk powder of the present invention and the process for producing the foodstuffs according to the invention are not limited to those obtainable by the material and the method described hereinbefore, but every materials possessing equivalent compositions and structures may be available within the scope of the present invention.

The de-lactose milk and the de-lactose milk powder of the present invention may be prepared by :

- (a) using fat including one or more milk fats selected from the group consisting of fresh cream, butter and butter oil ; and
- (b) using protein including one or more Thai two milk protein selected from the group consisting of TMP, MPC casein, casein salt and WPC ; and by the processes of ;
- (c) homogenizing the said fat and the said protein in aqueous solution to the range from 0.33 to 3.0 of ratio of the fat to the protein (F/P) for conjugation of the fat with the protein thereby to form a stable O/W emulsion structure; and in case of the de-lactose milk powder
- (d) drying and pulverizing the mixture obtained by the step (c) by the methods such as the spray dry and the freeze dry.

In the aforementioned step (c), the bulking agent of the soluble dietary fiber and/or the sugar alcohol may preferably be added with content up to 2.5 of maximum ratio to total solid amounts of protein and the fat by weight and more preferably from 0.5 to 2.5 in order to increase the stability of the O/W emulsion structure and facilitate the pulverization in case of the de-lactose milk powder used. The bulking agent preferably consists of one or more soluble dietary fibers and/or the sugar alcohols selected from the group consisting of polydextrose, inulin, indigestible dextrin, lactitol, maltitol, palatinit[®] and erythritol.

The de-lactose milk and the de-lactose milk powder according to the present invention may include the milk ash.

The foodstuffs containing the de-lactose milk and the de-lactose milk powder according to the present invention may be produced by the regular process with use of the de-lactose milk and the de-lactose milk powder in place of skim-milk, whole milk powder and processed milk.

PREFERRED EXAMPLES

The present invention will be described by the following Examples with reference to the comparisons and the contrasts. The following Examples should not be limitative but merely illustrative of the present invention. In the Examples, terms "%" and "part" represent "% by weight" and "part by weight", respectively unless otherwise denoted particularly.

Example 1 De-lactose milk powder consisting of milk fat and milk protein.

(1) De-lactose milk powder A consisting of fresh cream and milk protein

To 557g of fresh cream of 47% fat was added 400g of water and 276g of TMP was further added with stirring at 2000 rpm for 10 minutes by means of the homomixer and was then emulsified. The mixture was concentrated by the rotary evaporator in a hot bath at 50 °C to reach 50% water, and the concentrate was freeze-dried by the freeze dryer to obtain 520g of the powder forming the de-lactose milk powder A.

(2) De-lactose milk powder A' consisting of butter oil and milk protein

To 243g of butter oil was added 680g of water, and 276g of TMP was further added with stirring at 2000 rpm for 10 minutes by means of the homomixer and was then emulsified. The mixture was concentrated by the rotary evaporator in a hot bath at 50 °C to reach 50% water, and the concentrate was freeze-dried by the freeze dryer to obtain 518g of the powder forming the de-lactose milk powder A'.

(3) Unemulsified de-lactose milk powder A consisting of butter oil and milk protein

The unemulsified de-lactose milk powder was produced by merely blending the fat and the protein without any emulsification in the aqueous solution. 520g of butter oil and 540g of TMP were mixed and stirred by the vertical mixer at medium speed for 10 minutes to obtain 1060g of the powder forming the unemulsified de-lactose milk powder A.

(4) Comparison test : About a fat source of the testing de-lactose milk powder and a presence of the emulsification

Chocolate was produced for trial using the de-lactose milk powders A, A' or the unemulsified de-lactose milk powder A described hereinbefore by the conventional process with the following recipe :

cacao mass	20 parts
milk powder	12 parts
lactitol	30 parts
polydextrose	18 parts
cocoa butter	19.5 parts
emulsifier	0.5 parts
vanilla flavour	0.1 part
aspartame	0.1 part

In production of the chocolate using the unemulsified de-lactose milk powder A, the rolling step was carried out for three times while usually once to obtain 30 micrometers of maximal particle diameter since milk protein is inconvenient for pulverization and likely forms the chocolate of large particle size.

Three kinds of chocolate thus produced were panel-tested by 20 persons with the following results.

[Table 1]

Questions	Answers	Chocolate containing the de-lactose milk powder A	Differ little	Chocolate containing the de-lactose milk powder A'
Which is tastier?		4 persons	12 persons	4 persons
Which feelings do you		4 persons	14 persons	2 persons

prefer?			
Which aromas do you like?		1 person	17 persons
			2 persons

Questions	Answers	Chocolate containing the de-lactose milk powder A	Differ little	Chocolate containing the unemulsifying de-lactose milk powder A
Which is tastier?		17 persons	1 person	2 persons
Which feelings do you		18 persons	2 persons	None
prefer?				
Which scents do you like?		16 persons	2 persons	2 persons

As shown in the upper column of Table 1, it was appeared that there was no substantial difference between tastes of the chocolates prepared for trial by using the de-lactose milk powder A and the de-lactose milk powder A'. Thus, the de-lactose milk powder of equivalent quality may be obtained even when fresh cream, butter oil, or butter obtainable by making butter oil from fresh cream is used as the fat source of the de-lactose milk powder.

As shown in the lower column of Table 1, it was appeared that taste, feel and flavor of the chocolate prepared with the de-lactose milk powder through the emulsification step is superior to that of the unemulsified de-lactose milk powder. Further, in case of using the unemulsified de-lactose milk powder, the rolling steps are required for three times with less productivity as hereinbefore described.

Example 2 De-lactose milk powder containing the bulking agent

(1) De-lactose milk powder B containing the bulking agent

To 600g of fresh cream of 45.2% fat and 49.5% water was added 400g of water and 10g of the milk serum mineral salt was further added and mixed and stirred. 300g of TMP and 450g of polydextrose as the bulking agent were then added and the mixture was homogenized at 2000 rpm for 10 minutes by means of the homomixer to prepare the de-lactose milk powder having a stable O/W emulsion structure. Then the de-lactose milk powder was dried by the spray dryer to obtain the powder having a composition of 2.9% water, 26.3% fat, 25.2% protein and 1.5% lactose which was mostly derived from the milk serum mineral, and of others such as dextrose and ash as guessed. The powder thus obtained forms the de-lactose milk powder B.

(2) Unemulsified de-lactose milk powder B containing the bulking agent

The unemulsified de-lactose milk powder was produced by merely blending the fat and the protein without any emulsification in the aqueous solution. 260g of butter oil of 100% fat, 260g of TMP, 470g of polydextrose and 10g of the milk serum mineral salt were mixed and stirred by means of the vertical mixer at the low speed for 5 minutes and then

at the medium speed for 5 minutes to obtain the powder as hereinbefore described. The composition of the powder obtained was 2.5% water, 26.1% fat, 24.2% protein and 0.3% lactose which was mostly derived from the milk serum mineral, and others like dextrose and ash as guessed. The powder forms the unemulsified de-lactose milk powder B.

5 (3) Whole milk powder

The composition of the whole milk powder used as a contrast was 2.8% water, 26.5% fat, 25.3% protein and 39.5% lactose.

10 (4) Comparison test : Comparison among the de-lactose milk powder obtained through the emulsifying step, the unemulsified de-lactose milk powder and the whole milk powder

Chocolate was produced for trial by the conventional process with use of the de-lactose milk powders B, the unemulsified de-lactose milk powder B or the whole milk powder described hereinbefore with the following recipe :

15	cacao mass	20 %
	milk powder	20 %
	lactitol	20 %
	maltilol	18 %
20	cocoa butter	20 %
	emulsifier	0.3 %
	vanilla flavour	0.1 %
	aspartame	0.1 %

25 In the case using the unemulsified de-lactose milk powder B, the rolling steps were repeated for 3 times to obtain 30 micrometers of maximal particle diameter like the case of using the unemulsified de-lactose milk powder A as described hereinbefore since the roll-mill pulverizing efficiency was not sufficient. When the de-lactose milk powder B or the whole milk powder was used, there were some differences in the pulverizing efficiency which however falls within a range possible to cope by adjusting the pressure of rolling, and the single rolling step has caused no trouble.

30 Three kinds of chocolate thus produced were panel-tested by 50 female students of the high school with the following results.

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[Table 2]

Questions	Answers	Chocolate containing the de-lactose milk powder B	Differ little	Chocolate containing the nonemulsifying de-lactose milk powder B
Which is tastier?		40 persons	8 persons	2 persons
Which feelings do you prefer?		45 persons	4 persons	1 person
Which scents do you like?		35 persons	10 persons	5 persons

Questions	Answers	Chocolate containing the whole milk powder	Differ little	Chocolate containing the nonemulsifying de-lactose milk powder B
Which is tastier?		29 persons	11 persons	10 persons
Which feelings do you prefer?		33 persons	12 persons	5 persons
Which scents do you like?		30 persons	12 persons	8 persons

Questions	Answers	Chocolate containing the de-lactose milk powder B	Differ little	Chocolate containing the whole milk powder
Which is tastier?		20 persons	15 persons	15 persons
Which feelings do you prefer?		23 persons	5 persons	22 persons
Which scents do you like?		20 persons	15 persons	15 persons

As shown in Table 2, the chocolate prepared by using the de-lactose milk powder B according to the present invention was the tastiest in all of three trial chocolates.

The chocolate of the whole milk powder entailed some heating smell caused by the Maillard reaction of the free amino acid from the milk protein with the reducing sugar, while that of the de-lactose milk powder B made less heating smell. It was guessed that there was a difference of palatability between the chocolates of the de-lactose milk powder B and of the whole milk powder particularly in their scent (lower column of Table 2), as the heating smell affected the scent of the chocolates.

Example 3 White chocolate with use of the de-lactose milk powder

(1) De-lactose milk powder C

To 650g of butter (80.3% fat and 16.2% water) obtained by churning and centrifuging fresh cream of 45.5% fat and 49.2% water was added 1000g of water, and 500g of TMP, 20g of the milk serum mineral and 2g of sodium citrate were also added and mixed for the emulsification under the pressure of 120 kg/cm² to prepare a de-lactose milk of stable O/W emulsion structure. Then, the de-lactose milk was dried by the spray dryer to obtain a powder having the composition of 3.2% water, 48.3% fat and 46.6% protein and forming a de-lactose milk powder C.

(2) Whole milk powder

The whole milk powder used as a contrast had the composition of 2.8% water, 26.5% fat, 25.3% protein and 39.5% lactose.

(3) Comparison test : Comparison of white chocolates using the de-lactose milk powder C and the whole milk powder

White chocolate was prepared for trial using the de-lactose milk powder C by the conventional process with the following recipe :

milk powder	11 parts
cocoa butter	33.5 parts
lactitol	24.9 parts
palatinit	10 parts
polydextrose	20 parts
emulsifier	0.4 parts
vanilla flavour	0.1 part
aspartame	0.1 part

On the other hand, another white chocolate was prepared for trial using the whole milk powder C by the conventional process with the following recipe :

milk powder	20 parts
cocoa butter	33.5 parts
lactitol	15.9 parts
palatinit	10 parts
polydextrose	20 parts
emulsifier	0.4 parts
vanilla flavour	0.1 part
aspartame	0.1 part

The panel-test for the two white chocolates prepared as hereinbefore described were carried out by 50 female students of the high school to obtain the following results.

[Table 3]

Questions	Sugar-less white chocolate containing the de-lactose milk powder C	Differ little	White chocolate containing the whole milk powder
Which is tastier?	18 persons	20 persons	12 persons
Which feelings do you prefer?	17 persons	18 persons	15 persons
Which scents do you like?	22 persons	13 persons	15 persons

As described in Table 3, the white chocolate using the de-lactose milk powder C was equivalent or tastier than that using the whole milk powder which had a milk flavor lacking in freshness on account of the heating smell of the milk per se (such as milkard smell, caramel smell) and the like.

On the other hand, the sugar-less white chocolate using the de-lactose milk powder C had less heating smell but provided a fresh milk taste.

The chocolate with use of sugar causes a specific body by synergistic effect of sweetness flavor derived from sugar itself and a heating smell of the whole milk powder for more favorite. The sugar-less chocolate with sugar alcohol, however, has mere or less cooling effect, and brings out a cool flavor of mints or citrus as well-known. Sugar alcohol incor-

porated with milk is used for foodstuffs in congenial to a milk flavor with freshness rather than a flavor having body. Thus, in case of manufacturing the sugar-less chocolate, it is preferable to use the de-lactose milk powder prepared by the process according to the present invention in order to retain the flavour of the sugar alcohol.

6 Example 4 De-lactose milk powder containing the bulking agent

(1) De-lactose milk powder D

To 650g of butter (80.3% fat and 16.2% water) obtained by churning and centrifuging fresh cream of 45.5% fat and 49.2% water was added 1000g of water, and 500g of TMP, 20g of the milk serum mineral and 3g of sodium citrate were also added and mixed for emulsification under the pressure of 150 kg/cm² to prepare a de-lactose milk having a stable O/W emulsion structure. Then, the de-lactose milk was dried by the spray dryer to obtain a powder of the composition of 2.2% water, 48.9% fat and 46.8% protein forming a de-lactose milk powder D.

15 (2) De-lactose milk powder E containing polydextrose

To 650g of butter (80.3% fat and 16.2% water) obtained by churning and centrifuging fresh cream of 45.3% fat and 49.5% water was added 1500g of water and 20g of the milk serum mineral was also added for mixture. 570g of TMP and 1230g of polydextrose syrup were further added and carried out homogenization by the homomixer at 2000 rpm for 10 minutes to prepare a de-lactose milk powder having a stable O/W emulsion structure. Then, the de-lactose milk thus obtained was dried by the spray dryer to obtain a powder of the composition of 2.1% water, 26.2% fat, 25.1% protein and 0.3% lactose forming a de-lactose milk powder E.

(3) Comparison test : About presence of the polydextrose or a bulking agent in the de-lactose milk powder

25 The following test was carried out so as to examine about an addition of the polydextrose when the de-lactose milk powder is prepared.

Chocolate was prepared for trial with use of the de-lactose milk powder D by the conventional process with the following recipe :

30 cacao mass	23 parts
milk powder D	12 parts
cocoa butter	20 parts
lactitol	14 parts
35 polydextrose	20.5 parts
erythritol	10 parts
emulsifier	0.3 parts
vanilla flavour	0.1 part
aspartame	0.1 part

40 In case of preparing the chocolate with use of the de-lactose milk powder D, a maximal particle size of the trial chocolate arrived 35 micrometers at the rolling pressure of 17 kg/cm² with rough feel. Then, the rolling pressure was elevated to 22 kg/cm² for pulverization, so that a preparation of fine particle of less than 10 micrometers was relatively increased with drop of the treating capacity of the rolling mill.

45 On the other hand, another chocolate was produced for trial with use of the de-lactose milk powder D by the conventional process with the following recipe :

50 cacao mass	23 parts
milk powder E	22 parts
cocoa butter	20 parts
lactitol	14 parts
polydextrose	10.5 parts
erythritol	10 parts
emulsifier	0.3 parts
55 vanilla flavour	0.1 part
aspartame	0.1 part

In case of preparing the chocolate with use of the de-lactose milk powder E, the pulverization could be carried out at the rolling pressure of 17 kg/cm² in the rolling step.

The following table shows the date of the rolling pressure, the treating capacity and the particle size of the trial chocolate in the rolling step for preparing chocolates in the tests.

[Table 4]

Items	Roll pressure (kg/cm ²)	Throughput (kg/hr)	Maximum particle size (μ)	Proportion of fine particles*
De-lactose milk powder D	22	31.3	27	△ - ×
De-lactose milk powder D	17	39.1	35	○
De-lactose milk powder E	17	50.2	28	⊗

* ⊗: Few, ○: Normal, △: More, ×: Most

The panel-tests were carried out for the chocolates prepared with use of the de-lactose milk powder D through the rolling step at the rolling pressure of 22 kg/cm² and with use of the de-lactose milk powder E through the rolling step at the rolling pressure of 17 kg/cm² by 50 female students of the high school with the following results.

[Table 5]

Questions	Answers Chocolate containing the de-lactose milk powder D	Difference Chocolate containing the de-lactose milk powder E
Which is tastier?	15 persons	22 persons
Which feelings do you prefer?	12 persons	13 persons
Which seems do you like?	10 persons	25 persons

The results showed that it was preferable to add the polydextrose when the de-lactose milk powder is prepared. It was guessed that the powder of a particle structure of the polydextrose entangled with the protein is rather tolerated than that of a particle structure comprising only the protein conjugating the fat when pulverized.

The difference in the palatability of the feel in the panel-tests was likely resulted from the fact that the proportion of the fine particle of less than 10 micrometers was rather greater in the chocolate prepared with use of the de-lactose milk powder D through the rolling step at the rolling pressure of 22 kg/cm² than the chocolate prepared with use of the de-lactose milk powder E through the rolling step at the rolling pressure of 17 kg/cm². When the chocolate is prepared with use of the de-lactose milk powder, the rolling pressure is compelled to increase in order to obtain the maximal particle size of less than 30 micrometers, resulting in increment of the proportion of fine particle while drop of the treating capacity of the rolling mill. The increment of the proportion of fine particle in the chocolate would lead to increment of the viscosity of the chocolate with unfavorable property of tardiness in mouth. In this point of view, it was found preferable to use polydextrose (or a replaceable bulking agent) when the de-lactose milk powder is prepared.

Example 5 De-lactose milk powder containing the bulking agent of various amounts

According to the result of Example 4 as hereinbefore described, it was appeared that an addition of a bulking agent such as polydextrose when the de-lactose milk powder is prepared affects to the capacity of the preparation of the chocolate but also the quality, more particularly its feel of the chocolate. An upper limit of the quantity of the bulking agent to be used for the chocolate has been examined.

(1) De-lactose milk powders F - K

Fresh cream of 45% fat and 49.5% water was churned and centrifuged at 2000 rpm for 10 minutes to obtain butter (80.2% fat and 15.3% water) to prepare butter oil to be a raw material for the de-lactose milk powder which was then subjected to a further centrifugation.

Lactitol and polydextrose with a ratio of 1:1 were well mixed and added with water for 40% concentration, to prepare a syrup as a bulking agent.

2400g of water was added to 800g of the butter oil as described hereinbefore and 800g of TMP for sufficient mixing. Then, the syrup prepared was added with one of the contents selected from 0g, 800g, 1600g, 2400g, 3200g and 4000g for mixing and emulsifying under the pressure of 150kg/cm², and then dried and pulverized by the spray dryer to obtain the de-lactose milk powders of six types forming the de-lactose milk powders F, G, H, I, J and K, respectively.

(2) Examination of the contents of the bulking agents in the de-lactose milk powders

Results of the examinations about ratio by weight of the bulking agent (a syrup of lactitol and polydextrose with 1:1 ratio) against the total weight of the fat and the protein (E/D), facilities of pulverization with respect to the de-lactose milk powders F to K as hereinbefore described are shown in following Table 6.

[Table 6]

Items	Sum of fat and protein D (g)	Lactitol-polydextrose syrup E(g)	E/D ratio	Powderizing condition
Milk powder				
De-lactose milk powder F	1600	0	0	There is no problem with the powderization.
De-lactose milk powder G	1600	800	0.5	Good powderizing.
De-lactose milk powder H	1600	1600	1.0	Good powderizing.
De-lactose milk powder I	1600	2400	1.5	Good powderizing.
De-lactose milk powder J	1600	3200	2.0	Slightly down the drying rate.
De-lactose milk powder K	1600	4000	2.5	Slightly down the drying rate.

Increment of a value E results in lowering of a dry efficiency of water in the pulverization step as shown in Table 6. When the E/D exceeds over 2.5, there was no substantial influence on quality of the chocolate even there may be caused a mere problem of restricting a degree of compounding in the preparation of the chocolate. Preferable E/D ratio was less than 2.5.

Example 6 Examination of ratio of the fat to the protein (F/P ratio) in the de-lactose milk powder

(1) De-lactose milk powders L - T

Fresh cream of 45.2% fat and 49.8% water was churned to obtain butter of 81.3% fat and 15.8% water and then the butter was centrifuged at 3000 rpm for 10 minutes to prepare butter oil of 100% fat.

3000g of water was measured and the protein (MPC) determined in quantities to the range from 300g to 1700g (9 grades) was added for solubilization with stirring at 500 rpm for 5 minutes. Then, defined quantity of the butter oil as

hereinbefore described was added as the fat for homogenization at 2000 rpm so that a total weight of the fat with the protein as previously added is 2000g and then homogenized for ten minutes and emulsified. Dries and pulverization by the spray dryer were then carried out to obtain nine types of the milk powders or de-lactose milk powders L, M, N, O, P, Q, S and T which were prepared by addition of 300g, 500g, 567g, 800g, 1000g, 1200g, 1333g, 1500g and 1700g, respectively.

(2) Comparison test

Chocolates were prepared for trial with use of the de-lactose milk powders L to S prepared in the above (1) for examination about an influence by the ratio of the fat to the protein (F/P ratio) in the de-lactose milk powder against the stability of O/W emulsion structure, the milk flavour, the qualifications for processing and the taste when chocolate prepared.

Chocolates were prepared for trial with use of the conventional processes with the following recipe :

cacao mass	15 %
milk powder	22 %
palatinit	20%
maltilol	10 %
erythritol	10 %
inulin	5%
cocoa butter	22.5 %
emulsifier	0.3 %
vanilla flavour	0.1 %
aspartame	0.1 %

The protein quantity, the fat quantity, the E/P ratio, the milk flavour of the milk powder and the taste of the chocolate as the product were shown as follows.

[Table 7]

Items	Fats (g)	Protein (g)	F/P ratio	Quantity of add water (g)	Emulsification stability	Milk flavor	Chocolate production aptitude	Milk flavour at chocolate
Milk powder								
De-lactose milk powder L	300	1700	0.18	3000	Stable	Lose	Bad	Weak
De-lactose milk powder M	500	1500	0.33	3000	Very stable	Slightly lose	Slightly bad	Slightly weak
De-lactose milk powder N	667	1333	0.50	3000	Very stable	Slightly good	Common	Common
De-lactose milk powder O	800	1200	0.67	3000	Very stable	Good	Common	Good
De-lactose milk powder P	1000	1000	1.00	3000	Stable	Good	Good	Good
De-lactose milk powder Q	1200	800	1.50	3000	Stable	Good	Good	Good
De-lactose milk powder R	1333	667	2.00	3000	Common	Slightly good	Good	Common
De-lactose milk powder S	1500	500	3.00	3000	Slightly unstable	Slightly lose	Good	Slightly butter smell
De-lactose milk powder T	1700	300	5.60	3000	Unstable	Lose	Common	Strong butter smell

The protein contributes to stabilize the O/W emulsion structure and to keep the milk flavour with conjugation of the fat therein. It was unpreferable to reduce the E/F ratio, for example, into less than 0.33 in order to cause the milk flavour since the milk flavour is mainly derived from butter. When the protein is increased, then an over-load is applied to the roll in the rolling mill step resulting in a reduction in productivity and variation of the particle size with deterioration in feel of the chocolate. In contrast, if E/F ratio is increased to, for example, over 3.0, then the free fat is increased with increment of the butter smell when the milk powder is stored whereby the milk flavour is deteriorated. The butter smell becomes greater than its freshness, for which reason there is no longer merit of reconstruction of the de-lactose milk powder. If anything, in the light of keeping the milk flavour, it would be preferable that the de-lactose milk powder was prepared to obtain an optimal F/P ratio (which may be estimated near 1) before the milk fat (butter oil) is separately added in preparing a chocolate due to less off flavour of the milk powder.

Thus, it was found that the E/F ratio of the de-lactose milk powder (the de-lactose milk) is preferable in the range from 0.33 to 3.0.

Example 7 Chocolate with use of the de-lactose milk powder containing sugar alcohol

(1) Preparation for trial of a chocolate

Chocolates including various sugar alcohols as sweeteners were prepared for trial with use of the de-lactose milk powder E made in Example 4-2) by the conventional process with the following recipe:

cacao mass

20 %

de-lactose milk powder E	20 %
sugar alcohols	39.5 %
cocoa butter	20 %
lecithin	0.5%
vanillin	adequate amount
aspartame	adequate amount

The chocolates with use of lactitol as a sugar alcohol, palatinit, maltitol, sorbitol, xylitol, erythritol, polydextrose, inulin and indigestible dextrin form the chocolate 1, the chocolate 2, the chocolate 3, the chocolate 4, the chocolate 5, the chocolate 6, the chocolate 7, the chocolate 8 and the chocolate 9, respectively.

(2) Comparison tests : Examination about sugar alcohols using for sugar-less chocolates with use of the de-lactose milk powder

When a sugar-less chocolate is prepared with use of the de-lactose milk powder, sugar alcohol is preferably used to enhance its milk flavour.

For examinations of which sugar alcohols is preferable, evaluation tests of the chocolates containing a sugar alcohol with use of the de-lactose milk powder E prepared in Example 4-2) as hereinbefore described were carried out by 10 panelists. The evaluation was carried out with use of the 100 points full marks scoring method which judges 50 points as standard and more than 70 points as good. Results obtained were shown in the following table.

[Table 8]

Chocolates	Contained sugar alcohol	Items for mark				A short review
		Milk impression	Sweet ness	Feel ings	General grade	
Chocolate 1	Lactitol	85	82	88	84	The milk impression is good.
Chocolate 2	Palatinit [®]	78	75	62	70	The milk impression is good.
Chocolate 3	Maltitol	72	77	68	75	Well balanced the milk impression and the sweetness.
Chocolate 4	Sorbitol	42	55	60	62	A cooling impression muffle the milk impression.
Chocolate 5	Xylitol	46	68	68	65	There are good feeling between sweetness matters.
Chocolate 6	Erythritol	38	58	70	55	Taste bitter.
Chocolate 7	Polydextrose	60	52	55	58	Milk impression and bad feeling.
Chocolate 8	Inulin	58	48	52	55	The feeling is bad.
Chocolate 9	Indigestible dextrin	52	45	51	50	The feeling is bad.

According to the results of Table 8, it was found that the use of lactitol, palatinit and maltitol were preferable in the

light of the enhancement of the milk flavour. The use of polydextrose or inulin alone causes a deterioration of feel. It has, however, been known that the feel was improved by co-use with a low hygroscopic sugar alcohol such as lactitol or palatinol and it is preferable to use thus polydextrose or inulin together with them.

8 Example 8 De-lactose milk

(1) De-lactose milk U and De-lactose milk powder U

650g of butter (80.3% fat and 16.2% water) obtained by churning and centrifuging fresh cream of 45.3% fat and 49.5% water was added with 1500g of water and 20g of the milk serum mineral was also added and mixed. 570g of TMF and 1230g of polydextrose syrup were further added for homogenization at 2000 rpm for 10 minutes to prepare the de-lactose milk having a stable O/W emulsion structure as a de-lactose milk U. Then, a part of the de-lactose milk is collected to be dried and pulverized by the spray dryer to obtain a de-lactose milk powder U. The powder was the composition of 2.1% water, 26.2% fat, 25.1% protein and 0.3% lactose.

(2) Sugar-less milk soft candy with use of the de-lactose milk U

Sugar-less milk soft candy with use of the de-lactose milk U prepared in the above(1) as hereinbefore described was prepared with the following recipe :

20	palatinol	20 parts
	maltitol	20 parts
	De-lactose milk U (49.7% water)	20 parts
	polydextrose syrup	55 parts
25	charge water	20 parts
	vegetable oil	5 parts
	emulsifier	0.1 part
	vanilla flavour	0.1 part

30 Palatinol, maltitol and polydextrose syrup were mixed with the charge water at 70°C to be dissolved. Then, the de-lactose milk U, the vegetable oil and the emulsifier were added and mixed for uniform dispersion. The mixed solution thus obtained was then condensed under a reduced pressure to reach 7 % moisture so that a flavour is added in soft dough and then cooled to have an appropriate hardness for a bite size shaping in order to obtain a sugar-less milk soft candy.

(3) Sugar-less milk soft candy with use of the de-lactose milk powder U

Sugar-less milk soft candy was prepared for trial with use of the de-lactose milk powder U prepared in the above (1) with the same recipe and by the same process in the above (2). The de-lactose milk powder U was reduced with the same weight of water for substitution for the de-lactose milk in the above (2).

(4) Sugar-less ice used the de-lactose milk U

45 Sugar-less ice was prepared with use of the de-lactose milk U prepared in (1) as hereinbefore described with the following recipe :

	salt-free butter	12 parts
	calcium caseinate	2 parts
	De-lactose milk U	12 parts
50	maltitol	10 parts
	polydextrose	5 parts
	reduced starch syrup	10 parts
	stevia (high performance sweetener)	0.05 parts
	emulsification stabilizer	0.5 parts
55	salts	0.5 parts
	vanilla flavour	0.2 parts
	carotenoids	adequate amount
	water	100 parts as a total quantity with the above compositions

Calcium caseinate, de-lactose milk U, maltitol, polydextrose reducing starch syrup, high performance sweetener and salts were dissolved in water. Salt-free butter and the emulsification stabilizer were further added by heating to 55°C and homogenized by the homogenizer at 150 kg/cm² by weight for forming a stable O/W emulsion structure. After disinfection at 85°C for 30 seconds and cooled to 4°C, the flavour and carotenoids were added. Then, a freezing was carried out at -4.5°C with 80% of overrun and charged into cups for the final hardening to -18°C in order to obtain a sugar-less ice as a final product.

(5) Sugar-less ice with use of the de-lactose milk powder U

Sugar-less ice with use of the de-lactose milk powder U was obtained by the same recipe and the process similar to those of (4) as hereinbefore described except use of 6 parts of the de-lactose milk powder U prepared in (1) as hereinbefore described for replacement by 12 parts of the de-lactose milk powder U.

(6) Comparison tests : comparison between the products with use of the de-lactose milk and the products with use of the de-lactose milk powder

Panel tests were carried out for the foodstuffs as prepared for trial in (2)-(5) in order to determine a presence of the difference in qualities of the products between the product with use of the de-lactose milk or the product with use of the de-lactose milk powder.

The sugar-less milk soft candies of (2) and (3) as hereinbefore described were tested by 10 panelists and the sugar-less ices of (4) and (5) as hereinbefore described were tested by 12 panelists. Results were shown in the following table.

[Table 9]

Answers	Sugar-less milk soft candy containing the de-lactose milk U	Differ little	Sugar-less milk soft candy containing the de-lactose milk powder U
Questions			
Which is tastier?	1 person	8 persons	1 person
Which sweetness do you like?	2 persons	7 persons	1 person
Which scents do you like?	1 person	7 persons	2 persons

Answers	Sugar-less ice containing the de-lactose milk U	Differ little	Sugar-less ice containing the de-lactose milk powder U
Questions			
Which is tastier?	2 persons	9 persons	1 person
Which sweetness do you like?	2 persons	7 persons	3 persons
Which scents do you like?	2 persons	8 persons	2 persons

According to the results of Table 9, no difference was found in quality between the products obtained with use of the de-lactose milk and the products obtained with use of the de-lactose milk powder according to the present invention.

(7) Evaluation test of quality

The sugar-less milk soft candy and the sugar-less ices of (2)-(5) as hereinbefore described were finished as the products having a fresh milk body matching for sugar alcohol specific plain sweetness. About the sugar-less milk soft candies and the sugar-less ices, the evaluation test was carried out with use of scoring by the panelists as similar to the above panel test. Results were shown in the following table.

[Table 10]

Sugar-less milk soft candy					
	5	4	3	2	1
Quality of taste	5 persons	4 persons	1 person	None	None
Quality of sweetness	6 persons	4 persons	None	None	None
Milk flavor	5 persons	5 persons	None	None	None
Sugar-less ice					
	5	4	3	2	1
Quality of taste	6 persons	5 persons	1 person	None	None
Quality of sweetness	5 persons	5 persons	2 persons	None	None
Milk flavor	6 persons	6 persons	None	None	None
5:Very good, 4:Good, 3:Normal, 2:Bad, 1:Very bad					

Example 2 Sugar-less chocolate with use of the de-lactose milk powder containing sugar alcohol and soluble dietary fiber

Sweetener using for a sugar-less chocolate is restricted to sugar alcohols or dietary fibers. However, problems such as (i) the rough feel of chocolate and (ii) the laxation because of stronger laxative effect are occurred when sugar alcohol only is used as a sweetener.

The use of the de-lactose milk and the de-lactose milk powder according to the present invention is one of effective ways in order to solve those problems. Co-use of a soluble dietary fiber with a sugar alcohol is also effective.

A sequential change of feeling, when the sugar alcohol was used, resulted in the continuous linking with water in the chocolate the to form the rough and large sugar alcohol particles. Thus, the degradation of feeling is prevented by reducing a quantity of the addition of sugar alcohol and by providing an amorphous soluble dietary fiber in order to trap the free water and dissociate the sugar alcohol particles. Although use of a vegetable oil or an emulsifying agent may be effective when the subject is restricted to feeding only, the soluble dietary fiber is preferably used in the sugar-less chocolate to prevent the laxative effect positively.

Thus, a test was carried out to determine a ratio of a sugar alcohol to soluble dietary fiber by weight (SA/SDF) which are used as sweeteners for the sugar-less chocolate.

(1) Preparation of sugar-less chocolates with various ratios of SA/SDF

Eight types of sugar-less chocolates with the SA/SDF ratios in the range from 0.34 to 4.44 were prepared by varying quantities of palmitin and polydextrose by recipes in the following table. Use was made of the de-lactose milk powder E prepared in Example 4-2) as hereinbefore described to obtain chocolates 10-17.

[Table 11]

Chocolates	10	11	12	13	14	15	16	17
SA/SDF ratio	0.34	0.50	0.69	1.00	1.05	2.16	3.26	4.44
Cacaomass	20	20	20	20	20	20	20	20
De-lactose milk powder E	20	20	20	20	20	20	20	20
Cocoa butter	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5
Palatinit	12.5	16.3	20.0	24.5	29.0	33.5	37.5	40.0
Polydextrose	27.5	23.7	20.0	15.5	11.0	6.5	2.5	0.0
Emulsifier	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Vanilla flavour	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Aspartame	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

(2) Evaluation test : Examination of the SA/SDF ratios in the sugar-less chocolates

Evaluation test of the chocolates prepared for trial with the recipes as hereinbefore described was carried out with scoring (100 points of full marks scoring and standard score of 50 points) by 10 panelists. Results were shown in the following table.

[Table 12]

Chocolates	SA/SDF ratio	Grades			
		Milk flavor	Quality of sweetness	Feelings	Total grade
10	0.34	68	70	51	55
11	0.50	70	71	65	65
12	0.69	72	73	70	70
13	1.00	74	75	75	75
14	1.45	78	76	83	81
15	2.16	78	78	82	79
16	3.26	77	76	78	72
17	4.44	77	74	63	65

According to the results of table 12, it was found that the SA/SDF ratio in the sugar-less chocolate was preferably more than 0.5.

Example 10 Application of the de-lactose milk powder for a sugar-less chocolate with low calorie and/or low carious with use of erythritol and/or xylitol

A calorie of erythritol is considerably low since the calorie of erythritol is 0 kcal/g and calories of other sugar alcohols are almost 2 kcal/g. Consumers' needs against the low calorie sugar-less chocolate using the quality of low calorie are high. Xylitol is a sugar alcohol having an anti-carious effect and consumers' needs against the low carious sugar-less chocolate with use of xylitol as a sugar alcohol in a view of the prevention of carious are also great.

However, these two sugar alcohols entail pungency in throat caused by the cooling taste with a function of enhancing miscellaneous taste which are disadvantageous to qualities of taste of the chocolate.

Thus, the de-lactose milk powder according to the present invention was applied to a sugar-less chocolate of low

calorie and/or low carious with use of erythritol and/or xylitol to find that the de-lactose milk powder has an effect of improving the disadvantageous tastes of erythritol and xylitol to the chocolate. Examples are shown hereinafter.

(1) Application of the de-lactose milk powder to a low calorie sugar-less chocolate with use of erythritol

Low calorie sugar-less chocolates with use of erythritol including respectively 0%, 5%, 10% or 15% of the de-lactose milk powder E prepared in Example 4 (2) were prepared for trial to obtain the chocolates 18-21, respectively.

[Table 13]

Chocolates	18	19	20	21
De-lactose milk powder content	0%	5%	10%	15%
Cacao mass	20	20	20	20
De-lactose milk powder E	0	5	10	15
Cocoa butter	25.0	24.7	23.4	22.1
Erythritol	40	40	40	40
Emulsifier	0.4	0.4	0.4	0.4
Vanilla flavor	0.1	0.1	0.1	0.1
Palatinit	14.45	10.25	6.05	2.35
Aspartame	0.05	0.05	0.05	0.05

Taste of the four types of chocolates prepared with recipes described in Table 13 was checked by 10 panelists. The pungency in throat and miscellaneous taste were scored by comparison when a score of the chocolates with use of 0% de-lactose milk powder was to be 100 points. Thus, the lower the points was more preferable. The results were shown in the following table.

[Table 14]

Chocolates	De-lactose milk powder content	A feeling of bite in throat	A miscellaneous taste of cacao	Total grades
18	0%	100	100	Bad
19	5%	61	62	Normal
20	10%	52	42	Slightly good
21	15%	42	38	Good

According to the results of Table 14, it was found that the pungency in throat and the miscellaneous taste of cacao in the low calorie sugar-less chocolates with use of erythritol were improved by using the de-lactose milk powder of the present invention and the chocolates were more improved. It was further found that when 20% cacao mass and 40% erythritol were compounded, the effect was obtained by addition of 5% de-lactose milk powder and more remarkable effect was obtained by addition of more than 10% de-lactose milk powder.

(2) Application of the de-lactose milk powder for a low carious sugar-less chocolate with use of xylitol

Anti-carious sugar-less chocolates with use of xylitol respectively including 0%, 5%, 100% or 15% de-lactose milk powder E prepared in Example 4-2) were prepared for trial to form the chocolates 22-25, respectively.

[Table 15]

Chocolates	22	23	24	25
De-lactose milk powder content	0%	5%	10%	15%
Cacao mass	20	20	20	20
De-lactose milk powder E	0	5	10	15
Cocoa butter	25.0	24.7	23.4	22.1
Xylitol	40	40	40	40
Emulsifier	0.4	0.4	0.4	0.4
Vanilla flavor	0.1	0.1	0.1	0.1
Palatinit	14.5	10.3	6.1	2.4

Taste of the four chocolates prepared with recipes of Table 15 were checked by 10 panelists as well as (1) as herebefore described. Results were shown in the following table.

[Table 16]

Chocolates	De-lactose milk content	A feeling of bite in throat	A miscellaneous taste of cacao	Total grades
22	0%	100	100	Bad
23	5%	59	54	Normal
24	10%	47	40	Slightly good
25	15%	38	35	Good

According to the results of Table 16, it was found that the anti-cariou sugar-less chocolates with use of xylitol provided more improved chocolate by using of the de-lactose milk powder. It was further found that when 20% cacao mass and 40% erythritol were compounded, the effect was obtained by addition of 5% de-lactose milk powder and the remarkable effect was obtained by addition of more than 10% de-lactose milk powder.

Example 11 De-lactose milk powder including a fat except the milk fat and including a protein except the milk protein

In the de-lactose milk and the de-lactose milk powder of the present invention, the milk fat as a source of fat and the milk protein as a source of protein are preferably used, but to determine a substitutability of ones not derived from the fresh milk by parts of the fat and protein, the de-lactose milk powder including a fat and a protein except the milk fat and the milk protein was prepared.

(1) De-lactose milk powder V including cocoa butter and soybean protein

400kg of butter oil, 200kg of cocoa butter, 250kg of TMP, 50kg of sodium caseinate, 200kg of soybean protein, 728kg of polydextrose, 20kg of milk ash mineral salt and 2 kg of sodium citrate were added to 2730kg of water with stirring and mixed and emulsified under the pressure of 120 kg/cm² to obtain a mixture having a stable emulsion structure and further dried by spray dryer to obtain a powder forming the de-lactose milk powder V.

(2) Unemulsified de-lactose milk powder V including cocoa butter and soybean protein

Without emulsifying the fat and the protein in the aqueous solution, the blending thereof only was used to prepare the unemulsified de-lactose milk powder, 400kg of butter oil, 200kg of cocoa butter, 250kg of TMP, 50kg of sodium caseinate, 200kg of soybean protein, 728kg of polydextrose, 20kg of milk ash mineral salt and 2 kg of sodium citrate

were blended to obtain a powder as the unemulsified de-lactose milk powder V.

(3) Comparison and Evaluation test : De-lactose milk powder including a fat and a protein not derived from fresh milk

Chocolate was prepared for trial with use of the de-lactose milk powder V or the unemulsified de-lactose milk powder V as hereinbefore described by the conventional process with the following recipe :

cacao mass	16 parts
cocoa butter	21.8 parts
milk powder	22 parts
maltilol	39.65 parts
emulsifier	0.4 parts
milk flavour	0.1 part
aspartame	0.05 parts

Panel tests were carried out by 10 panelist about taste of two types of the chocolates accordingly prepared and the following results were obtained.

[Table 17]

Questions	Answers	Chocolate containing the de-lactose milk powder V	Differ little	Chocolate containing the non-emulsified de-lactose milk powder V
Which is tastier?	9 persons	1 person	None	
Which feelings do you prefer?	10 persons	None	None	
Which seems do you like?	7 persons	3 persons	None	

As shown in the above table, the chocolate with use of the de-lactose milk powder V prepared through the emulsification step was more excellent in taste, feel and flavour. When the chocolate was prepared with use of the unemulsified de-lactose milk powder V, the pulverization in the rolling step is considerably inferior as compared with preparation of a general chocolate and the chocolate with use of the de-lactose milk powder V, for which reason a difference in the feel appears.

Evaluation test of quality was carried out to the chocolates with use of the de-lactose milk powder V by the same 10 panelist as hereinbefore described and the results were shown in the following table.

[Table 18]

	5	4	3	2	1
Quality of taste	4 persons	5 persons	1 person	None	None
Quality of sweetness	3 persons	5 persons	2 persons	None	None
Milk flavor	4 persons	6 persons	None	None	None
5:Very good, 4:Good, 3:Normal 2:Bad, 1:Very bad,					

When the soybean protein was used, although a specific grassy smell of the soybean protein was anxious, the

grassy smell was decreased by co-use with the milk protein. According to Table 18 as hereinbefore shown, it was found that there is no problem for foodstuffs to use the de-lactose milk powder with partly use of the fat and/or protein underived from fresh milk.

Example 12

(1) Biscuit with use of the de-lactose milk

Sugar-less biscuit with use of the de-lactose milk was prepared with the following recipe :

weak flour	100 parts
lactitol	15 parts
erythritol	5 parts
polydextrose	5 parts
shortening	25 parts
egg	10 parts
de-lactose milk powder U	15 parts
sodium bicarbonate (inflating agent)	1.5 parts
salt	1 part
vanilla flavour	0.1 part
stevia (high performance sweetener)	0.15 parts
water	2 parts

Lactitol, erythritol, polydextrose, the high performance sweetener, the de-lactose milk powder U and vanilla flavour were well mixed with the shortening and dispersed for subsequent mixing of eggs, salt dissolved in the water and the inflating agent and creaming up to reach 0.75 specific gravity before the flour was finally added in order to prepare a dough.

The dough was shaped in any shape for baking at 200°C for 12 minutes in order to obtain a sugar-less biscuit.

(2) Biscuit with use of the de-lactose milk powder

Sugar-less biscuit was prepared with use of the de-lactose milk powder U in the same recipe and by the same process. The de-lactose milk powder U was added so as to be equivalent to the solid content included in the de-lactose milk U and the moisture was adjusted by increasing the addition of water.

(3) Comparison test : Comparison of a product with use of the de-lactose milk to a product with use of the de-lactose milk powder

Panel tests were carried out in order to examine confectioneries (biscuits) prepared for trial by the process as hereinbefore described. The comparison test was tested by 12 panelists and the results were shown in the following table.

[Table 19]

Answers	Sugarless biscuit containing the de-lactose milk U	No difference	Sugarless biscuit containing the de-lactose milk powder U
Questions			
Which is tastier?	1 person	9 persons	2 persons
Which feelings do you prefer?	2 persons	8 persons	2 persons
Which smells do you like?	3 persons	7 persons	2 persons

Example 13

(1) Sugar-less milk coffee with use of the de-lactose milk powder

Sugar-less milk coffee with use of the de-lactose milk powder was prepared with the following recipe :

coffee extract*	500ml
erythritol	20g
maltitol	10g
high performance sweetener	0.1g
de-lactose milk powder U	40g
milk ash minerals	2g
emulsifier	0.1g
sodium caseinate	0.5g
total (with addition of water)	1000ml

coffee extract* : roast coffee beans was pulverized, to be extracted with 600ml of hot water before adjustment at pH 6.5 with sodium bicarbonate.

Erythritol, maltitol, high performance sweetener, the de-lactose milk powder U and milk ash minerals were added into 500ml of hot water at 70°C and well mixed, and the emulsifier and sodium caseinate were further added to be well stirred and mixed, 500ml of the coffee extract obtained by extraction of coffee beans with hot water was added thereto to form the sugar-less milk coffee.

(2) Sugar-less milk coffee with use of the de-lactose milk

Sugar-less milk coffee with use of the de-lactose milk powder U was prepared with the same recipe and by the same process. The de-lactose milk U was added so as to be equivalent to the solid content included in the de-lactose milk powder U so that the total amount of coffee liquid is 1000 ml.

(3) Comparison test : Comparison of a product with use of the de-lactose milk to a product with use of the de-lactose milk powder

Panel tests were carried out about drinks (coffee) prepared for trial by the process as hereinbefore described. The comparison test was tested by 10 panelists and the results obtained were shown in the following table.

[Table 20]

Questions	Sugarless milk coffee containing the de-lactose milk U	No difference	Sugarless milk coffee containing the de-lactose milk powder U
Which is tastier?	1 person	8 persons	1 person
Which sweetness do you like?	None	10 persons	None
Which scents do you like?	2 persons	6 persons	2 persons

From the above results and the results of the candy and the ice as hereinbefore described, it was found that there is no difference in quality of products between when the de-lactose milk was used in confectionery, ice and drinks and when the de-lactose milk powder was used according to the present invention.

(4) Evaluation test of quality :

For sugar-less biscuit and the sugar-less milk coffee, sugar alcohols were used to obtain light modish taste of plain sweetness which is different from when using sugar. About the sugar-less biscuit and the sugar-less milk coffee, the evaluation tests were carried out by the same panelists as hereinbefore described.

[Table 21]

Sugarless biscuit					
	5	4	3	2	1
Quality of whole taste	6 persons	5 persons	1 person	None	None
Quality of sweetness	4 persons	7 persons	None	None	None
Milk flavor	2 persons	5 persons	5 persons	None	None
Sugarless milk coffee					
	5	4	3	2	1
Quality of whole taste	6 persons	6 persons	None	None	None
Quality of sweetness	4 persons	4 persons	2 persons	None	None
Milk flavor	7 persons	3 persons	None	None	None
5:Very good, 4:Good, 3:Normal, 2:Bad, 1:Very bad					

Example 14

(1) Biscuit with use of the de-lactose milk powder

Sugar-less biscuit with use of the de-lactose milk powder was prepared for trial with the following recipe :

weak flour	100 parts
lactitol	15 parts
erythritol	5 parts
polydextrose	5 parts
shortening	30 parts
egg	10 parts
de-lactose milk powder	10 parts
inflating agent	1.5 parts
salt	1 part
vanilla flavour	0.1 part
high performance sweetener	0.15 parts
water	5 parts

Lactitol, erythritol, polydextrose, the high performance sweetener, the de-lactose milk powder and the flavour were well mixed with the shortening and dispersed for subsequent well mixing egg, salt dissolved in water and the inflating agent, creaming up at a high speed by the mixer to reach 0.75 specific gravity before the flour was finally added in order to prepare a dough.

The dough was shaped in any shape for being at 200°C for 12 minutes in order to obtain a sugar-less biscuit.

(2) Comparison 1 : Biscuit was prepared with the same recipe and by the same process as in Example 14 except

using the regular whole milk powder in place of the de-lactose milk powder.

(3) Comparison 2 : Biscuit was made with the same recipe and by the same process as in Example 14, except using in place of 10 parts of the de-lactose milk powder, 2.8 parts of extracted milk protein, 2.6 parts of butter oil, 3.6 parts of polydextrose and 0.5 part of whey minerals.

(4) Evaluation of sensory test : Evaluation of sensory tests were carried out about samples of Example 14, Comparisons 1 and 2 by 15 panelists.

[Table 22]

Samples	Biscuit of Example 14	Biscuit of Comparative Example 1	Biscuit of Comparative Example 2
Questions			
Which of the samples is tastiest?	10 persons	5 persons	None
Which of sweetness of the samples do you like best?	7 persons	5 persons	3 persons
Which of scents of the samples do you like best?	10 persons	3 persons	2 persons
Which of feelings of samples do you like better?	7 persons	7 persons	1 person

As results of the sensory tests, there was no difference between the biscuits of Example 14 and Comparison 1, but the biscuit of Comparison test 2 was inferior in hardness and roughness of taste.

In question of flavour, the biscuit of Example 14 received best evaluation and a sweetness of the sweetener used was adjusted to obtain the plain milk flavour. For Comparison 1, the heating smell of milk and the sweetness of the sweetener used was unbalanced and for Comparison 2, whole flavour was insufficient while greasy of butter was emphasized in the biscuit and thus both biscuits had unsuitable and unpreferable taste.

Example of Sugar-less coffee

Reference 1

coffee extract	500ml
erythritol	20g
maltitol	10g
stevia	0.1g
whole milk powder	20g
whey minerals	2g
emulsifier	0.5g
sodium caseinate	0.5g
total (with addition of water)	1000ml

Whole milk powder, whey minerals, the emulsifier and sodium caseinate were added to 300 ml of hot water at 70°C for mixing and subsequent addition with erythritol, maltitol and stevia. 500 ml of coffee extract was added for subsequent adjustment to pH 6.9 with sodium bicarbonate and to 1000 ml with water to form a Coffee drink (1).

Example 15

coffee extract	500ml
erythritol	20g
maltitol	10g
stevia	0.1g
de-lactose milk powder U	20g
whey minerals	2g
emulsifier	0.5g
sodium caseinate	0.5g
total (with addition of water)	1000ml

The de-lactose milk powder U, whey minerals, the emulsifier and sodium caseinate were added to 300 ml of hot water at 70°C for mixing and subsequent addition of erythritol, maltitol and stevia. 500 ml of coffee extract was added for adjustment to pH 6.9 with sodium bicarbonate and to 1000 ml with water to form a coffee drink (2).

Reference 2

coffee extract	500ml
erythritol	20g
maltitol	10g
stevia	0.1g
milk protein	5g
butter	5g
reites	10g
whey minerals	2g
emulsifier	0.5g
sodium caseinate	0.5g
total (with addition of water)	1000ml

The milk protein, butter reites, whey minerals, the emulsifier and sodium caseinate were added to 300 ml of hot water at 70°C for mixing and subsequent addition of erythritol, maltitol and stevia. 500 ml of coffee extract was added for adjustment to pH 6.9 with sodium bicarbonate and to 1000 ml with water to form a coffee drink (3).

Results of investigation for acceptability :

Acceptability investigation was carried out with use of the coffee drinks (1), (2) and (3) prepared in Examples. Panellists were 20 male and female who favor coffee, and the coffee drinks (1), (2) and (3) were ranked from first to third

according to the panelist's preference and scored 5 points, 3 points and 1 point from first to third, respectively, so that total points of the drinks were shown in the following table.

[Table 23]

	Coffee drinks ①	Coffee drinks ②	Coffee drinks ③
Merit of scent	62 marks	62 marks	56 marks
Coffee flavor	54 marks	72 marks	54 marks
Milk flavor	66 marks	84 marks	30 marks
Total grades	66 marks	82 marks	32 marks

Chronological stability :

The coffee drinks ①, ② and ③ were heated at 60°C and then homogenized with 150 kg/cm² for bottling at 80°C before retort-disinfection was carried out at 121°C for 20 minutes for observation of the chronological stability of the drinks at room temperature. As a result, it was found that although the drinks ①, ② and ③ were stable immediately after the retort-disinfection was carried out, after three days by, a ring of milk fat was observed at upper of the drink to demonstrate that the drink ③ becomes lack of the stability. It was also found that the coffee drinks ① and ② were more stable than the drink ③ and the drinks ① and ② have remained unchanged in the stability even after two weeks.

Claims

1. Process for preparing a de-lactose milk with use of

- (a) a fat including one or more milk fats selected from the group consisting of fresh cream, butter and butter oil, and of which lactose content is less than 2%, and
- (b) a protein including one or more milk proteins selected from the group consisting of TMP (total milk protein), MPC (milk protein concentrate), casein, casein salts and WPC (whey protein concentrate), which comprises the step of :
- (c) homogenizing the fat and the protein in aqueous solution to the range from 0.33 to 3.0 of ratio of the fat to the protein (F/P) for conjugation of the fat with the protein thereby to form a stable O/W emulsion structure.

2. Process for preparing a de-lactose milk according to claim 1, wherein a bulking agent consisting of soluble dietary fiber and/or sugar alcohol is further added in content up to 2.5 of maximum ratio to a total solid amount of protein and the fat by weight, and wherein preferably said bulking agent is one or more soluble dietary fibers and/or sugar alcohols selected from the group consisting of polydextrose, inulin, indigestible dextrin, lactitol, maltitol, isomaltitol and erythritol.

3. Process for preparing a de-lactose milk powder with use of

- (a) a fat including one or more milk fats selected from the group consisting of fresh cream, butter and butter oil, and of which lactose content is less than 2%, and
- (b) in protein including one or more milk proteins selected from the group consisting of TMP (total milk protein), MPC (milk protein concentrate), casein, casein salt; and WPC (whey protein concentrate), which comprises the steps of:
- (c) homogenizing the fat and the protein in aqueous solution to the range from 0.33 to 3.0 of ratio of the fat to the protein (F/P) for conjugation of the fat with the protein thereby to form a stable O/W emulsion structure; and
- (d) drying and powdering the mixture obtained by said homogenization step.

4. Process according to claim 3, wherein a bulking agent of soluble dietary fiber and/or sugar alcohol is further added with content up to 2.5 of maximum ratio to a total solid amount of the fat and the protein by weight, and wherein preferably said bulking agent is one or more soluble dietary fibers selected from the group consisting of polydextrose, inulin, indigestible dextrin, lactitol, maltitol, isomaltitol and erythritol.

5. De-lactose milk, which comprises :

- (a) a fat including one or more milk fats selected from the group consisting of fresh cream, butter and butter oil, and of which lactose content is less than 2%; and
 (b) a protein including one or more milk proteins selected from the group consisting of TMP, MPC, casein, casein salts and WPC,

wherein a ratio of the fat to the protein (F/P) is in the range from 0.33 to 3.0 and the fat is conjugated with the protein.

6. De-lactose milk according to claim 5, wherein the de-lactose milk further contains a bulking agent consisting of soluble dietary fiber and/or sugar alcohol in content up to 2.5 of maximum ratio to a total solid amount of the fat and the protein by weight, and wherein preferably said bulking agent comprises one or more soluble dietary fibers selected from the group consisting of polydextrose, inulin, indigestible dextrin, lactitol, maltitol, isomaltitol and erythritol.

7. De-lactose milk according to claim 5 or 6 wherein said de-lactose milk is in the form of powder.

8. Foodstuffs with use of de-lactose milk and/or de-lactose milk powder which comprises :

- (a) a fat including one or more milk fats selected from the group consisting of fresh cream, butter and butter oil, and of which lactose content is less than 2%; and
 (b) a protein including one or more milk proteins selected from the group consisting of TMP, MPC, casein, casein salts and WPC,

wherein a ratio of the fat to the protein (F/P) is in the range from 0.33 to 3.0 and the fat is conjugated with the protein.

9. Foodstuffs according to claim 8, wherein said de-lactose milk and/or de-lactose milk powder further contains a bulking agent of soluble dietary fiber and/or sugar alcohol with content up to 2.5 of maximum ratio to a total solid amount of the fat and the protein by weight, and wherein preferably said bulking agent comprises one or more dietary fibers and/or sugar alcohols selected from the group consisting of polydextrose, inulin, indigestible dextrin, lactitol, maltitol, isomaltitol and erythritol.

10. Foodstuffs according to claim 8 or 9, wherein said foodstuffs is sugar-less.

11. Foodstuffs according to any one of claims 8 to 10, wherein said foodstuffs is a chocolate, preferably a milk chocolate.

12. Foodstuffs according to claim 8 or 9, wherein said foodstuffs is sugar-less milk chocolate which contains as sweetener one or more sugar alcohols selected from the group consisting of lactitol, isomaltitol and maltitol, and wherein preferably said foodstuffs contains one or more compounds selected from the group consisting of polydextrose, inulin, indigestible dextrin and sorbitol.

13. Sugar-less chocolate with use of de-lactose milk and/or de-lactose milk powder containing erythritol and/or xylitol and comprises :

- (a) a fat including one or more milk fats selected from group of fresh cream, butter and butter oil, and of which lactose content is less than 2%; and
 (b) a protein including one or more milk proteins selected from the group of TMP, MPC, casein, casein salts and WPC,

wherein a ratio of the fat to the protein (F/P) is in the range from 0.33 to 3.0 and the fat is conjugated with the protein.

14. Sugar-less chocolate according to claim 13, wherein said de-lactose milk and/or de-lactose milk powder further contains a bulking agent of soluble dietary fiber and/or sugar alcohol with content up to 2.5 of maximum ratio to a total solid amount of the fat and the protein by weight, and wherein preferably said bulking agent comprises one or more soluble dietary fibers and/or sugar alcohols selected from the group consisting of polydextrose, inulin, indigestible dextrin, lactitol, maltitol, isomaltitol and erythritol.

gestible dextrin, lactitol, maltitol, isomaltitol and erythritol.

15. De-lactose milk, which comprises :

- 5 (a) a fat including one or more milk fats selected from the group consisting of fresh cream, butter and butter oil, and of which lactose content is less than 2%; and
(b) a protein including one or more milk proteins selected from the group consisting of TMP, MPC, casein, casein salts and WPC,

10 wherein a ratio of the fat to the protein (F/P) is in the range from 0.33 to 3.0 and said fat and protein are homogenized in aqueous solution and further the fat is conjugated with the protein thereby to form a stable O/W emulsion structure.

15 16. De-lactose milk according to claim 15, wherein the de-lactose milk further contains a bulking agent of soluble dietary fiber and/or sugar alcohol with content up to 2.5 of maximum ratio to a total solid amount of the fat and the protein by weight, and wherein preferably said bulking agent comprises one or more soluble dietary fibers and/or sugar alcohols selected from the group consisting of polydextrose, inulin, indigestible dextrin, lactitol, maltitol, isomaltitol and erythritol.

20 17. De-lactose milk according to claim 15 or 16 wherein said de-lactose milk is in the form of powder.

18. Foodstuffs with use of de-lactose milk and/or de-lactose milk powder, which comprises :

- 25 (a) a fat including one or more milk fats selected from the group consisting of fresh cream, butter and butter oil, and of which lactose content is less than 2%; and
(b) a protein including one or more milk proteins selected from the group consists of TMP, MPC, casein, casein salts and WPC,

30 wherein a ratio of the fat to the protein (F/P) is in the range from 0.33 to 3.0 and said fat and said protein are homogenized in aqueous solution and further the fat is conjugated with the protein thereby to form a stable O/W emulsion structure.

35 19. Foodstuffs according to claim 18, wherein said de-lactose milk also contains a bulking agent of soluble dietary fiber and/or sugar alcohol with content up to 2.5 of maximum ratio to a total solid amount of the fat and the protein by weight, and wherein preferably said bulking agent comprises one or more soluble dietary fibers and/or sugar alcohols selected from the group consisting of polydextrose, inulin, indigestible dextrin, lactitol, maltitol, isomaltitol and erythritol.

40 20. Foodstuffs according to claim 18 or 19, wherein the foodstuffs is sugar-less.



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EUROPEAN SEARCH REPORT

Application Number
EP 97 10 0655

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		20 May 1997	Desmedt, G
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written documents P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, not published on, or after the filing date D : document cited in the application L : document cited for other reasons A : number of the same patent family, corresponding document	

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EUROPEAN SEARCH REPORT

Application Number
EP 97 18 8655

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<p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p>		<p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons</p>	
		<p>& : number of the same patent family, corresponding document</p>	

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